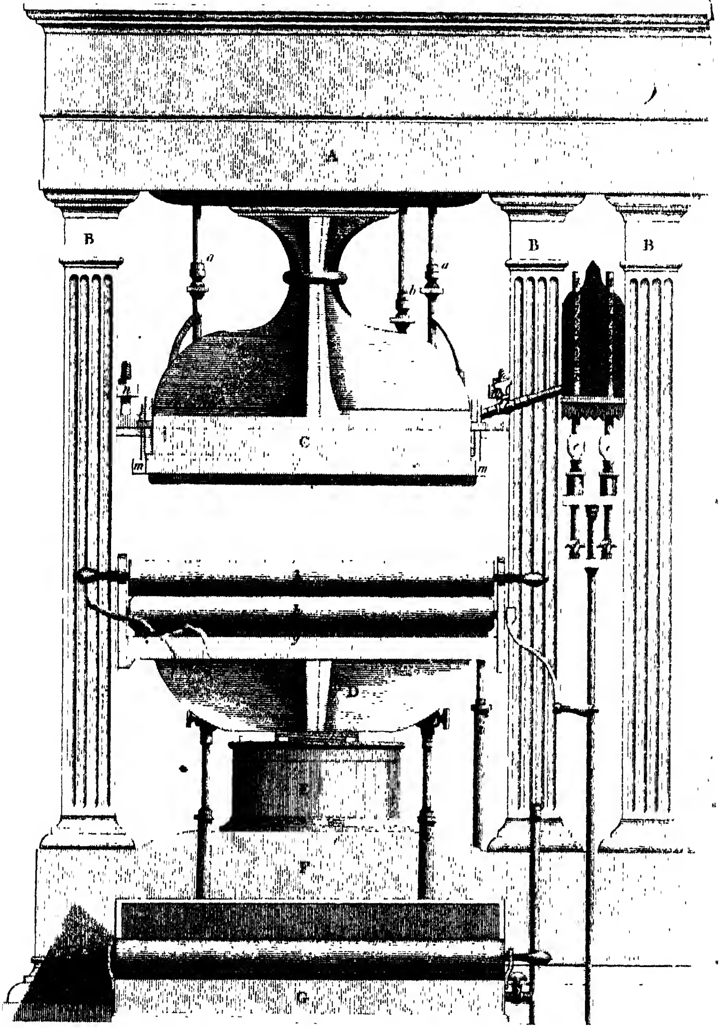
Plate V. Vol. II



Published by John Murray Albemarle Street London 18[illegible]

THE

JOURNAL

OF

SCIENCE AND THE ARTS.

EDITED AT THE ROYAL INSTITUTION
OF GREAT BRITAIN.

PUBLISHED QUARTERLY.

VOL. II.

LONDON:

PRINTED FOR JOHN MURRAY, ALBEMARLE-STREET,
BY W. BULMER AND CO. CLEVELAND-ROW, ST. JAMES'S.

1817.

THE

JOURNAL

OF

SCIENCE AND THE ARTS.

CONTENTS

TO

No. IV.

I. On the Laws of Muscular Motion. By J. R. Park, M. B. F. L. S. M. R. I. . . . . page 223

II. On the Heat evolved during the Coagulation of Blood. By J. Davy, M. D. F. R. S. 246

III. An Account of an atmospheric Electrometer. By Francis Ronalds, Esq. 249

IV. An Account of the Shepherds of the Landes, in the South of France. In a Letter to the Editor from Thomas Maynard, Esq. 253

V. Traité de Chimie, élémentaire, théorique, et pratique, par L. I. Thenard, &c. &c. &c. 255

VI. Of the Ergot or Clavus in Corn, known among Farmers by the name of the Spur. From an Essay on the Genus Sclerotium, by Mons. de Candolle, in the Mémoires du Muséum d'Histoire Naturelle, Paris. 272

VII. On the mechanical Structure of Iron developed by Solution, and on the Combinations of Silex in Cast Iron. By J. F. Daniell, Esq. F. R. S. and M. R. I. 278

VIII. Historical Notice of M. Péron (M. Deleuze, Ann. du Mus. d'Hist. Nat T. 17, Eloge Historique de F. Péron, Par M. Alard). 294

IX. On the Coniferous Plants of Kæmpfer. By R. A. Salisbury, Esq. F. R. S. &c. In a Letter to the Editor. 309

X. Some Account of the Meteoric Stones, in the Imperial Museum at Vienna. Communicated by Dr. Noehden. 314

CONTENTS.

XI. An Account of some Experiments on the Ergot of Rye, found in the Bois de Boulogne, near Paris. By Mons. Vauquelin, Member of the Royal Institute of France. In a Letter from Dr. Granville to the Editor. 320

XII. Transactions of the Batavian Society of Arts and Sciences. Vol. VII. (Batavia, 1814.) 326

XIII. A Review of the Genus Amaryllis. By John Bellenden Ker, Esq. 342

XIV. Solutions of some Problems by Means of the Calculus of Functions. By Charles Babbage, Esq. F. R. S. 371

XV. An Account of an improved Blow-pipe. In a Letter from Mr. John Newman, to the Editor. 379

XVI. Voyage de Découvertes aux Terres Australes, exécuté sur les Corvettes le Géographe, le Naturaliste, et la Coëlette le Casuarina. Rédigé en partie, par feu F. Péron, et continué par M. L. Freycinet. Historique, T. 2. Paris, 1816. 382

XVII. Asiatic Researches.—Vol. XII. 388

XVIII. An Abstract of an Account of the White Mountains. By Jacob Bigelow, M. D. from the New England Journal of Medicine and Surgery. 392

XIX. An Account of the Earthquake of Caraccas. By M. Palacio Faxar. 400

XX. On the Restoration of Vision, when injured or destroyed in Consequence of the Cornea having assumed a conical Form. By Sir William Adams 403

XXI. Analytical Review of the Scientific Journals published on the Continent, during the preceding Quarter. . 415

XXII. Evans's Accounts of Excursions beyond the Blue Mountains in New South Wales. 453

XXIII. Proceedings of the Royal Society of London. . 457

XXIV. Proceedings of the Royal Society of Edinburgh. 459

CONTENTS.

XXV. Miscellaneous Intelligence. 461

1. Report on some Experiments made with compressed Oxygene and Hydrogene in the Laboratory of the Royal Institution. 461

2. Notice of some Experiments on Flame, made by Sir H. Davy. 463

3. On the Wire-gauze Safe Lamps. 464

4. Announcements. 465

XXVI. Meteorological Diary for September, October, and November, kept at Earl Spencer's Seat, at Althorp in Northamptonshire. 470

JOURNAL *of* SCIENCE *and* ARTS, *edited at the Royal Institution.*

Notwithstanding the large Impression of the First Numbers of this Journal, their very rapid Sale has already called for an extensive Reprint.

The Second Editions of the first two Numbers (forming the First Volume), are ready for delivery, at Mr. Murray's, in Albemarle-street.

ERRATA.

Vol. I. Page 170. l. 11, from bottom, *for* bull-tuber *read* bulb-tuber.

p. 172. l. 17, from bottom, for *brevilius* read *brevifolius.*

Vol. II. p. 42. l. 15, *for* fire or axe are, *read* fire or axe is.

" p. 54. l. 3 from bottom, *after* the word surface, *insert* of the rock.

p. 263. line 10, *for* proportions *read* properties.

p. 278. line 21, *for* from *read* form.

p. 258. line 2, *for* consider *read* considers.

p. 260. line 17, *for* calorific *read* colorific.

p. 265. 3d line from bottom, *after* bodies *insert* "

CONTENTS

TO

Nº V.

On the Advancement of Science, as connected with the Rise and Progress of the Royal Institution. . . . . page i

I. An Enquiry into the Origin of our Notion of Distance. Drawn up from Notes left by the late Thomas Wedgwood, Esq. 1

II. On Pendulums vibrating between Cheeks. By Benjamin Gompertz, Esq. 13

III. Medical Jurisprudence. Foderé Médicine légale, 8vo. 6 vols. Paris, 1813. Orfila Toxocologie générale, considérée sous les Rapports de la Physiologie, de la Pathologie, et de la Médicine légale, Paris, 1815. 34

IV. A Descriptive Account of Mr. Thompson's Laboratory at Cheltenham, for the Preparation of the Cheltenham Salts; with a Chemical Analysis of the Waters whence they are produced. By W. T. Brande, Esq. Sec. R. S. F. R. S. E. M. Geol. Soc. Prof. Chem. R. I. &c.; and Samuel Parkes, Esq. M. R. I. F. L. S. M. Geol. Soc. &c. 54

V. An Account of Euler's Method of solving a Problem, relative to the Move of the Knight at the Game of Chess. From a Correspondent. 72

VI. Some Experiments and Observations on a new Acid Substsnce. By M. Faraday, Chem. Assistant in the Royal Institution. 77

VII. Natural and Statistical View of Cincinnati and the Miami Country. By Daniel Drake. Cincinnati, 1815. . . 81

VIII. Lithography. To the Editor. 88

IX. Journal of a Voyage up the River Missouri, performed in 1811. By H. B. Brackenbridge, Esq. Author of Views in Louisiana. Second Edition. Baltimore, 1816. . . 91

X. On the Genus Crinum. By John Bellenden Ker, Esq. 102

XI. On a new Species of Resin from India. By J. F. Daniell, Esq. F. R. S. M. R. I. 115

XII. On some Combinations of Platinum. By Mr. John Thomas Cooper. Addressed to the Editor. . . . 119

XII.* Botanical Extracts from a Periodical Miscellany published in Spain at Santa Fé de Bogotá, entitled "El Semanario del Nuevo Reyno de Granada." 1810. . . . 124

XIII. Proceedings of the Royal Society of London. . 129

XIV. Proceedings of the Royal Society of Edinburgh. 132

XV. Proceedings of the Academy of Sciences of the Royal Institute of France. 145

XVI. Analytical Review of the Scientific Journals published on the Continent. Continued from page 453, Vol. II. 179

XVII. Meteorological Diary for the Months of December 1816, and January and February 1817, kept at Earl Spencer's Seat at Althorp, in Northamptonshire. . . . 217

List of the Members of the Royal Institution. . . . 226

A List of Books presented to the Library of the Royal Institution in the year 1816. 233

List of Donations to the Mineralogical and Geological Collection in 1816. 235

Select List of New Publications, from July, 1816, to the 20th of March, 1817. 236

A Quarterly List of Foreign Scientific Publications. . 243

ERRATUM.

Page 12, line 24, for *tantochronic* read *tautochronic*.

THE QUARTERLY JOURNAL

OF

SCIENCE AND THE ARTS.

Art. I. *On the Laws of Muscular Motion.* *By* J. R. Park, *M. B. F. L. S. M. R. I.*

While every true friend to science laments the want of fixed principles in physiology, and the consequent uncertainty that prevails in medical reasoning; there are some who willingly avail themselves of this plea for neglecting its study, and idly exult in the assertion, that we have not sufficient knowledge of the animal economy to entitle this branch of philosophy to rank with the sciences.

Certain it is, that this want of fixed principles is a fruitful source of the many fanciful theories daily put forth, which reflect discredit on the medical profession, and weaken the confidence of the public in those who practise it.

Nor can any reasonable hope be entertained, that these visionary speculations will be effectually repressed, until the fundamental laws of animal life are more distinctly ascertained, and more regularly taught in medical schools.

With the fullest conviction of the utility of such an investigation, as well as a consciousness of the difficulties attending it, the attempt has been already made, by a careful analysis of the effects, to resolve into general principles the phenomena presented by the faculty of sensation.

There yet remains another primary attribute of animal life, which equally claims our attention, and presents phenomena no less interesting or important. This is the power of motion.

Motion is performed by means of muscular fibres; and all the functions of the body will be found to depend, either directly or indirectly, upon muscular contraction; the phenomena of which, when carefully examined, will also lead us to the knowledge of some general principles.

The power of motion, like the faculty of sensation, presents itself to our notice under a two-fold form.

As sensation, when subservient to what are termed animal functions, is attended with consciousness in the mind, as in the impressions made upon our organs of sense; so motion, in the same class of functions, is accompanied or preceded by an effort of the will, as in the voluntary exertion of our limbs.

But on the other hand, as sensation in automatic or organic functions is unattended by mental perception; this being the case with impressions on internal organs: so muscular motion, in this class of functions, is performed without any act of volition; as in the actions of the heart, stomach, and intestines.

Voluntary and involuntary motion present phenomena so different, as to have led some eminent physiologists to regard them as distinct faculties, radically different in their nature. By a separate consideration of each, it will the more readily be shewn, what ground there is for this conclusion.

Voluntary motion is allowed by all to consist in an altered condition of the moving fibre, produced through the intermediate influence of the brain and connecting nerves.

The nature of the change effected is a longitudinal approximation of the particles composing the fibre; producing a consequent diminution of its length, with some little increase of its thickness.

That very little general change of bulk however attends, has been proved experimentally, by immersing the arm in water, previously to contraction, and then throwing the muscles into action; which caused no perceptible change in the height of the fluid, though contained in a vessel with a graduated tube affixed to it, in such a manner as to have detected the slightest variation of bulk in its contents.

The means or agent that causes this change of condition in the moving fibre, is, however, the point which has most engaged the attention of physiologists, when it might perhaps have been more profitably employed in considering the effects. It will, therefore, be proper to state the prevailing opinions respecting the cause of contraction, before we proceed to deduce the laws of motion, from observance of its phenomena.

The most distinguished writers on this subject, Haller, Whytt, and Bichât, concur in admitting the agency of the nerve to be essential to the production of motion, when it is voluntary: but they differ in opinion as to the kind of agency it exerts.

Haller regarded contractility as a faculty inherent in the muscle, requiring only a stimulus to excite or call it forth. This power of exciting he ascribed to the nerve, acting under the control of the brain, and differing from other modes of irritation, in respect only to its greater force and activity.

Whytt, on the other hand, objected that this view was allotting to the muscle the property of sensation, as well as that of motion; for in fact, says he, a part must be sensible to irritation, and feel before it resists.

According to Whytt, the brain alone feels or is conscious of impressions transmitted to it through the nerves; and reacting through the medium of the nerves, imparts to the moving fibre something which operates upon it in such a way as transiently to alter its state of aggregation. Something which acts upon the muscle, not as a mere exciting cause, to call forth the exertion of an inherent power; but as the direct agent, or efficient means in producing the change of condition that ensues.

Bichât, when speaking of the share which the nerve has in producing voluntary motion or animal contractility, also calls it the essential agent, which transmits to the muscle the principle of motion, Anat. Générale, Tom. 1, p. 174.

" Nous verrons qu'ils sont les agens essentiels, qui leur transmettent le principe du mouvement; en sorte que la contractilité animale suppose toujours trois actions successive-

ment exercées, savoir, celle du cerveau, des nerfs, et des muscles."

This opinion of Bichât and Whytt is not only more simple and satisfactory than that of Haller, but will also be found more consonant with the phenomena.

But after all, it is no more necessary that we should ascertain the nature of the agent by which muscular contraction is effected, or that of the change it produces, in order to come at the general laws of motion, than it is necessary to discover the cause of gravitation, in order to find out the laws of inanimate matter.

The laws of muscular motion, like those of matter, must be deduced from the phenomena. To these then we shall now turn our attention.

The most familiar and remarkable circumstance attending voluntary motion, is the progressive change which the powers of action undergo from continued exertion.

When we begin to move our limbs, we usually find the first efforts are comparatively feeble and inert. But as we continue our exertions, until we grow warm with action, the energies of the body are gradually developed, and we soon attain to the full possession of our strength and activity. After a further period of exertion, this state of vigour and activity is succeeded by a sense of uneasines, which we call fatigue; and eventually we are compelled to desist from our efforts by the painful sensation they occasion, or the want of power to continue them.

These changes, though subject to considerable variety, in regard to degree and duration, may yet be perceptibly traced through all voluntary organs; and from these we may venture, without any knowledge of the cause that produces them, to lay down the following as laws of muscular motion.

1. That exertion is productive of certain changes in the organs of motion, which are accompanied by corresponding changes in the powers of action.

2. That the powers of action have certain limits prescribed to them, which sooner or later require the renovation derived from rest.

The progressive changes which the powers of action undergo, from continued exertion, vary in almost every organ; and are subject to further variation from the influence of habit; but for the sake of precision, they may be distinguished into three stages.

First,—The stage of inertia, or comparatively inefficient activity.

Secondly,—The stage of vigour, or the period of energetic action.

Thirdly,—The stage of fatigue, or painful and difficult exertion.

The degree of rest that is required to restore the powers of action, also varies according to the nature of the organ, the previous degree of exertion, and the influence of habit. But however rapid the renewal of power in some parts, or however protracted the period of exertion in others, still all voluntary organs manifestly have certain limits, beyond which the continuance of action becomes impossible, and rest indispensable.

Although the operation of these laws at present is restricted to voluntary organs, yet it will hereafter be seen, that they equally apply to those which are involuntary, and really admit of no exception. And this universality of the law certainly affords a presumptive proof that these alternations of action and rest proceed from some physical necessity, some change of condition in the moving organ, which is inseparable from muscular contraction.

Without inquiring into the nature of the nervous influence, we may readily conceive the probability of its producing such changes as those in question.

If, as some suppose, it be at all analogous to the galvanic energy in its mode of operation; it seems in no wise improbable, that its first applications should not produce their full effect on the muscular fibre; and therefore that the powers of action should not at once be fully developed.

That the fibre should gradually become more susceptible of its influence, as we grow warm with action, seems also

every way probable; and thus we should expect that the powers of action would for a time increase with exertion.

Further, that the repeated application of so powerful an agent, should at length produce changes that are excessive and painful, is analogous to what occurs from all other changes that are too rapid in their production, or too considerable in degree.

This view, however, is not offered for the purpose of establishing any supposed affinity between the nervous and galvanic energy; but merely to shew, that this supposition accords as well with the phenomena, or even much better, than another, which, though extensively received, is apparently erroneous, and requires to be refuted, as, in many respects, calculated to mislead.

The opinion contended for is this: that the sensation of fatigue arises from a change of condition in the moving fibre, effected by the repeated application of the nervous influence. Of this change, no matter what be its nature or cause, the mind becomes conscious when it arises at a certain degree, because the muscular structure, like every other, has some portion of nerve blended with its substance, and entering into its composition.

The opinion to be combated is this: that the sense of fatigue arises from the expenditure or exhaustion of that power or energy imparted by the nerve to the moving fibre; and not from the changes produced by its repeated application.

If not an offspring of the Brunonian hypothesis; this doctrine is so nearly allied to it, that a brief outline of that system is necessary to place it in a clearer point of view.

The system alluded to, was about the same period advanced by Brown and Darwin; and soon obtained disciples, by its apparent simplicity, which promised to save the trouble of any further research, and explain, in a summary way, all the mysteries of our nature.

We were only required to admit, that the brain is capable of secreting or generating a certain energy, termed by Dr. Brown, Excitability, and by Dr. Darwin, Sensorial Power; and allow this to undergo various degrees of accumulation

and expenditure, and its different states of fluctuation were deemed adequate to explain all the leading phenomena of life.

A deficient expenditure of this power was conceived to occasion *direct debility*, by allowing a morbid accumulation.

An excessive expenditure was said to cause *indirect debility*, by producing an exhaustion of this power.

Every impression acting upon the mind or body, and every action exerted by it, were conceived to occasion a loss or expenditure of excitability; fatigue was, therefore, a state of indirect debility, proceeding from immoderate expenditure of sensorial power.

A very able refutation of the many sophisms and inconsistencies which are involved in this doctrine, will be found in the Observations on Zoonomia, by Dr. Brown, the present professor of Moral Philosophy in Edinburgh; a work of great merit, displaying an uncommon share of ingenuity and metaphysical acumen in the author, at an early period of life. It would be foreign to our purpose to enter further into the subject at present.

That the excitability of Brown, the sensorial power of Darwin, and the nervous energy of Whytt and other physiologists, are only the same thing, under different denominations, is easily perceived. The question is not, as to its nature, but whether its expenditure and exhaustion are to be regarded as the cause of fatigue; which appears liable to the following objections.

In the first place,—The assumption on which it rests is gratuitous and unfounded.

Secondly,—The phenomena are incompatible with this supposed cause, if its existence were proved.—And,

Lastly,—They all perfectly accord with the view already offered, of a change in the moving fibre itself; which, moreover, may be directly proved to take place.

To return.—The assumption that the nervous energy is liable to be exhausted in the living body, appears unfounded.

This exhaustion, if it occur, must be either partial, or general. We will first suppose it partial.

Whatever be the nature of this fluid, power or energy, rapid

diffusibility is one of its most indisputable properties. The experiments of Dr. Wollaston, related in the Croonian Lecture for 1810, which render it probable that every muscular contraction consists of a number of separate shocks, following each other in such rapid succession, as to appear only a single effort of contraction, may convey some idea of the amazing velocity with which this energy is imparted by the nerve to the muscular fibre.

From this rapid diffusibility then, it would be expected, that the effects of a partial expenditure should be no longer felt than the time required for the exhaustion in one part to be replenished from others, or from the general reservoir, the sensorium, according to the Brunonian doctrine.

How is it then, that the pain of fatigue, and the effects of over-exertion, often last for many days or even weeks? Is this power so slowly diffused, or is it so long in reaccumulating?

But the exhaustion of excitability may be general, which we will next suppose it to be.

If the cause be general, the effects should be so likewise, and the over-exertion of one limb or organ should cause the sense of fatigue to be felt in others, or in all. This, however, is so far from being the case, that an extraordinary exertion may incapacitate one arm for several days, and the rest of the body feel no participation.

During the period of exertion, when the effort begins to excite painful sensation, merely changing the mode of action is often sufficient to alleviate weariness, even in the same limb, by calling other fibres into action, and allowing those to rest which were previously exerted.

Now, the pain should not be thus removed, by merely directing the nervous energy into a fresh channel, if its expenditure, and not its application, were the exciting cause of that pain.

Thus, there seems no ground for supposing such an expenditure of the nervous energy to take place, as to occasion pain from either a partial or general exhaustion.

But, secondly, were such an exhaustion allowed to take

place; the sense of fatigue, and the phenomena of muscular action, are not reconcilable with this, if assumed as their cause.

If the powers of action depend solely upon the due accumulation of this energy, and at length are suspended, in consequence of its exhaustion; then the activity should uniformly decline as the power is expended, and finally cease altogether when the period of exhaustion arrives.

Instead, however, of this being the case, activity is usually found to increase with exertion. Thus, the first dance is generally the most fatiguing: and a judicious sportsman spares his horse till he grows warm with action.

Further, when the powers of action appear nearly exhausted, they are often suddenly renewed, by the very means which, according to the Brunonian doctrine, should cause a still greater exhaustion, namely, a strong impression on the mind: thus, a soldier, sinking under the fatigue of a long march, when roused by the unexpected appearance of an enemy, awakened by the sense of danger, or animated by the hope of glory, feels his strength suddenly recruited, and forgets his fatigue.

Now, as every impression on the mind causes a further expenditure of excitability, according to the Brunonian system, this, instead of restoring the strength, should further augment the indirect debility which already prevails; and thus, the phenomena of fatigue are incompatible with this exhaustion as their assumed cause.

Lastly, it remains to be shewn, that they are consistent with the conclusion, that fatigue is a sensation arising from a change in the condition of the moving fibre itself, effected by the continued application of the nervous energy; and that direct proof of the existence of this change may be offered.

The state of the moving organ, on the approach of fatigue, appears in fact to be that of over-contraction, and not that of relaxation in the muscles; and strong impressions on the mind, having a tendency to take off spasm, as proved by daily experience, and in a manner that will hereafter be explained, this immediately moderates the spastic state of the

muscle, and restores its powers of action; just as friction, cordials, or a warm bath, would equally produce the same effect in cases of over-fatigue.

The efficacy of such remedies, applied to the moving organs, under similar circumstances, further attests that they are the immediate seat of the change which takes place; were this proof wanting to establish the fact, that a spasmodic state of the muscles is the real cause of fatigue. Of this, however, we have still more direct evidence in the actual condition of the organs themselves.

As fatigue approaches, nothing is more common than cramps or spasms in the calves of the legs, and the soles of the feet, denoting an excess, and not a want of contractility; therefore, not a deficient, but an excessive application of nervous influence.

And when at length exertion has been so long continued, that the power of motion is impeded, or supported with pain and difficulty, the condition of the muscles presents nothing like a state of relaxation, as if wanting the power to contract; but, on the contrary, a state of rigid firmness, wanting the power to relax. Both flexor and extensor muscles will be found at this period to be alike rigidly contracted, by which the limb is for a time immovably fixed, and the power of motion impeded, until this spastic state is removed, by means similar to those already mentioned; or until the contraction spontaneously subsides by rest and sleep.

Finally, we have the most conclusive evidence of the muscles being the seat of the changes that occur, in the sensible and visible appearance of these organs which succeeds to immoderate exertion. When the spastic state goes off, and is followed by a subsequent relaxation, which will be found to bear always a relation to the degree of previous over-action, what is now the condition of the limbs?

It is one which could not have been disregarded, were physiologists more disposed to reason from obvious facts, which experience presents, and less attached to fanciful hypotheses.

The state of the muscle is one approaching to actual

inflammation; in fact, a manifest change in the condition of its capillary vessels, attended with pain, heat, redness, and swelling,—a condition requiring often the application of leeches, cupping glasses, or other modes of local evacuation, to unload the distended and weakened vessels, previously to the employment of those means which are best calculated to restore their natural tone.

Such are the grounds on which the conclusion rests, that fatigue is not an exhaustion of nervous energy, but that the moving fibre itself undergoes some change of condition during exertion,—that this change for a time facilitates and augments the powers of action; then, after a further period, renders its continuance irksome or painful; and finally brings on a state approaching to tonic spasm, which partially impedes or wholly suspends the power of motion, until rest has relaxed the spasmodic contraction.

But to whatever conclusion we may come, respecting the nature of the changes that occasion these successive stages in the phenomena of motion; their actual occurrence is a matter of observation and experience, admitting of no doubt or dispute. And the laws deduced from them rest entirely upon the facts themselves; their truth and certainty being wholly independent of the accuracy of the explanation, here offered, of the cause that produces them.

The importance of these principles or laws of motion would be comparatively trifling, if their influence were confined to the class of voluntary organs, which alone we have hitherto considered; but few will be disposed to consider it so, if their operation can be shewn to extend also to those which are involuntary.

Voluntary and involuntary motion do certainly present many striking points of difference; but the question is, whether these be sufficient to constitute them distinct faculties, radically and essentially different in their nature, or only different modifications of the same faculty.

Whytt contended for their identity, and maintained, that involuntary, as well as voluntary organs, derive their power of action immediately from their nerves.

Haller denied their identity, and contended, that nerves, although the chief instruments in producing voluntary motion, have yet nothing to do with that which is involuntary.

Bichât inclines to the same opinion; which, if established, would afford the strongest support to his system; and he has consequently exerted his utmost ingenuity to furnish arguments in its favour, though, after all, he appears afraid to profess it.

His chief arguments are derived from direct experiment, and deserve the most attentive consideration; as any proof that the same physical means are not employed in the production of voluntary and involuntary contraction, would at once be conclusive against the identity of the faculties; whereas variations in the mode, duration, or power of action in the two classes, would only constitute them different modifications of the same, and not distinct faculties.

Bichât's experiments consist in galvanizing the nerves leading to muscles of each class; galvanism being the most powerful agent yet discovered for exciting muscular contraction; and thus bringing it to the test, whether the involuntary muscles can be affected through the medium of their nerves, as well as the voluntary.

When the voluntary muscles of an animal recently killed are submitted to the operation of galvanism, through the medium of the nerves from which they derive their power of motion, sudden and violent contractions, or convulsive motions, are produced by it. But, on the other hand, as Bichât informs us, when galvanism is applied to the nerves leading to involuntary organs, similar effects do not ensue.

In his Anatomie Générale, T. 3, P. 364, he says,—

"Je ne me suis pas contenté des agens ordinaires, pour m'assurer du defaut d'action actuelle des nerfs sur les muscles organiques;—J'ai employé le galvanisme, et je me suis assuré, que ce moyen de mettre en jeu les contractions musculaires, est très peu efficace, presque nul dans la vie organique."

That is,—galvanism was found to have very little, scarcely any, influence in exciting contractions in the muscles of organic life. Even Bichât could not say it had no influence.

But we proceed and follow him in the statement of his experiments and their results.

. He allows that the experiment of Humbolt, and those of Jadelot, affords result different from his own. Speaking of one of Humbolt's, which he repeated, and which consisted in detaching the heart of an animal from the body, isolating one, of its nerves, and trying to excite contractions, by galvanizing the isolated nerve, he thus expresses himself. Recherches Physiol. P. 318.

" Je l'ai tenté inutilement plusieurs fois ;—Cela a paru me reussir cependant, dans une occasion."

After several failures, he acknowledges that it did succeed once. Again, in P. 336 of the same work, he thus states the result of his own experiments on the stomach, rectum, and bladder.

" J'ai mis a decouvert les nerfs qui partent des ganglions pour aller directement à l'estomac, au rectum, à la vessie, et j'ai galvanizé par ce moyen ces divers organs.

" Aucune contraction ne m'a paru ordinairement en resulter: quelque fois un petit resserrement s'est fait appercevoir, mais il etait bien faible en comparaison de ces violentes contractions qu'on remarque dans les muscles de la vie animale."

Here again he is obliged to acknowledge, that although in general no sensible effect was produced on the stomach, bladder, or rectum, yet sometimes a slight retraction or drawing together was perceptible, though widely different from the violent contractions produced in the voluntary muscles.

The following passage is taken from his Anatomie Générale, Vol. 3, P. 360.

" Je remarque, cependant, que l'irritation d'un des nerfs vagues ou de tous les deux, fait tout suite contracter l'estomac, comme cela arrive pour un muscle volontaire, dont on irrite les nerfs."

When we now reconsider the results of these experiments, and find, that Bichât himself is constrained to acknowledge that galvanism appeared to have some influence when applied to gangliac nerves, causing "un petit resserrement ;" that in

galvanizing the heart according to Humbolt's experiment, though it failed several times, yet it succeeded once:—and that the stomach contracts just like a voluntary muscle, from galvanizing the par vagum—it will not surely be contended, that these are results to warrant the conclusion, that nerves have no influence at all in producing the contraction of involuntary organs.

These experiments, on the contrary, afford direct proof of their possessing this power of throwing the muscle into action, though doubtless in a manner different from that in which they operate upon voluntary organs, producing contractions neither so sudden nor so violent.

Accordingly, Bichât draws pretty nearly the same conclusion; though his reluctance to admit any thing that weakened the basis of his favourite system, prevented his perceiving the legitimate conclusions to be drawn from his own experiments; which strongly tend to establish the truth of the position, that animal and organic, or voluntary and involuntary motion, are produced by similar means, and present similar phenomena; and consequently they afford no grounds for supposing them to be radically distinct faculties, however they may be modified in respect to their mode, degree, or duration of action.

In fact, the difference between the effect of irritation applied to the nerves leading to voluntary and to involuntary muscles, is scarcely more striking than that which appears when it is made to act upon different muscles of the same class, as experimentally ascertained by Bichât himself.

Thus convulsive contractions are most readily excited in those muscles which are naturally rapid and sudden in their mode of action, and least so in those which are naturally slow and uniform in their contractions.

In his Anat. Génér. T. 3, P. 276, 7, he says,—

" Je remarque que tous les nerfs de la vie animale ne paraissent pas aussi susceptibles les uns que les autres de transmettre aux muscles les diverses irradiations du cerveau. En effet, tandis que dans les maladies, dans les plaies de tête, dans nos expériences, &c. les muscles des membres entrent en

convulsion, ou sont paralysés avec une extrême facilité; ceux du ventre, du cou, et surtout de la poitrine, ne présentent ces phenomènes que quand les causes d'excitation ou d'affoiblissement sont portées au plus haut point.".........On pourroit faire une échelle de la susceptibilité des muscles pour recevoir l'influence cérébrale, ou des nerfs pour la propager, au haut de laquelle on placeroit les muscles des membres, puis ceux de la face, puis ceux du larynx, ensuite ceux du bassin et du bas ventre, enfin les intercostaux et le diaphragme. Ces derniers sont, de tous, ceux qui entrent le plus difficilement en convulsion ou en paralysie. Observez combien cette échelle est accommodée à celle de fonctions."......

If then, it appear, as Bichât states, that those muscles are most easily thrown into convulsive action, whose actions are naturally most sudden and violent; and those are least easily excited to sudden contraction, whose actions are naturally most regular and uniform; why is it to be wondered at, that the same difference of effect which attends the operation of other modes of exciting them to action, should also be found to result from the influence of galvanism?

In short, there appears no ground for supposing any radical difference between voluntary and involuntary motion, or that nerves instrumental to the production of the one, are not so to that of the other.

It is true, that contractions may be excited by causes of irritation applied directly to the muscles themselves, as well as to the nerves leading to them. But this circumstance by no means disproves the instrumentality of nerves, since their extreme branches are intimately blended with the structure of the muscle, and inseparable from its substance. This power, moreover, of contracting from direct irritation, is alike possessed by muscles of both classes, and forms therefore no ground of distinction between them.

The circumstance of the one being preceded by, or attended with an effort of volition, and the other not, can only be regarded as constituting them different modifications of the same faculty; just as sensation is still to be regarded as essentially the same, whether attended or unattended by conscious

reflection; and in both faculties this circumstance, of their occurring under a two-fold form, may be traced up to the same source, and shewn to result from the same cause.

The brain being equally the immediate organ of volition as well as reflection, the degree in which the motion of any part is subject to the control of the will, as well as the capability each part possesses of exciting mental perceptions, bears a relation to the intimacy of its nervous connection with the sensorium, or the proportion of nerves it derives from the cerebral, and that it receives from the gangliac system.

The muscles of the limbs, those of the face, of the organs of speech, have the most direct nervous connection with the brain, and accordingly their actions are most subject to the influence and control of the will.

The internal viscera, the organs of circulation and nutrition, derive their nerves chiefly from the gangliac system, and their actions are consequently automatic, or not directly subject to the influence of the brain.

Some again, as the organs of respiration, are furnished with nerves from both sources, or derive them partly from the cerebral, and partly from the gangliac system; and their actions are partially under the control of the will, and partially automatic or involuntary.

The identity of the power of motion, whether attended with volition or not, is established, not only by the similarity of the means employed in the production of both, but also in the analogy of the phenomena they present, and the uniformity of the laws by which they are governed.

The limitation of power, too manifest to require illustration, in the organs of voluntary motion, is also observable in those which are involuntary, and is the first point which tends to establish their identity.

The approach of that period at which rest becomes necessary, is not indeed in the latter, as it is in the former, announced by the sensation we call fatigue; because their nerves, which, as just stated, are derived chiefly from the gangliac system, are not so well calculated to awaken mental perception. Those, however, which have cerebral nerves, do

excite perception in the mind after a certain period of action; thus hunger is the perception of the changes going on in the stomach. But where this sensation is wanting, there are other indications that these organs undergo similar changes during exertion, and equally have their powers of action limited by the nature of this faculty, and the physical means instrumental to its support.

The circumstances that chiefly denote this limitation of their power, are the change of function they regularly experience, and the derangement that is liable to ensue if they are compelled to make a more than ordinary exertion, or to continue their efforts for a greater length of time than usual; as the following instances may serve to illustrate.

The blood vessels shew a state of relaxation, in the retardation of blood, and the swelling of the lower extremities, towards evening, in persons of delicate constitution. As the column of blood bears most on the extremities, it is here that its pressure is first felt, and here that the vessels are soonest overpowered by it. The heart shews its susceptibility of fatigue when fainting occurs, from long standing in the erect posture, without the aid of motion to keep up circulation in the extreme vessels. The stomach is fatigued by long continued efforts of vomiting; painful sensation attends it, and the powers of digestion are impaired for a time subsequent to this exertion. The exhibition of an active purgative exhausts, in the same way, the power of the intestines, and a degree of constipation usually prevails for a short time after its operation; while the continued use of active purgatives is well known to bring on habitual torpor in the bowels. The urinary bladder, if oppressed by long retention of urine, loses its power of contraction, and strangury ensues. The rectum, in the same way, loses its contractility from long retention and immoderate accumulation of fæces; and obstinate constipation is the result.

The capillary vessels shew the limited extent of their power in a great variety of instances, always by change of function in the organ to which they belong. The cold fit of fever, during which an unusual contraction prevails throughout the

capillary system, is followed by a proportionate relaxation and over-distension of those vessels in the hot fit. On the same principle, the more transient constriction of the superficial vessels causing the paleness of fear, is succeeded by an increase of heat and redness, indicating subsequent relaxation, and fulness of vessels in the face, and over the surface of the body. The thin watery secretion from the nose, on exposure to severe cold, denoting increased contraction in the secreting vessels, is followed by a dryness and sense of heat in the part, denoting subsequent relaxation and distension of these vessels. Suppressed secretion of urine in hysteria, originating often in the kidneys, and not in the bladder, as proved by the fruitless introduction of the catheter, usually terminates in a secretion remarkably copious. Inordinate or long continued contraction of the exhalents of the cellular membrane, from exposure to cold and damp, is not unfrequently the cause of dropsy in the lower extremities, denoting loss of tone, and consequent relaxation of these vessels, terminating in serous effusion.

In short, the instances are innumerable which might be adduced to prove the universality of this law in the animal economy. Many of the most interesting phenomena of our nature, which have hitherto baffled the attempts of physiologists to account for them, will hereafter be proved to take their origin in this general principle; such as the periodical sensations of hunger and thirst, and the diurnal revolutions of sleep and waking, with all their attendant circumstances.

Further, it will not only be seen, that involuntary, as well as voluntary organs, have their powers of action limited, requiring and experiencing a degree of rest proportionate to that of their previous exertion; but it will also be shewn, that the same fluctuations of power, or successive stages of action, accompany exertion in both; which further establishes the identity of this power under both its modifications.

For instance, it has been remarked by Haller, Hunter, Whytt, Bichât, and others, that the pulse is commonly somewhat slow and languid in the morning; but becomes fuller and stronger towards mid-day; is more quick and irritable towards evening, the period of febrile exacerbation in

invalids; and, at length, full and slow circulation succeeds, denoting spontaneous relaxation of the vessels, as sleep approaches. The same fluctuations will also be traced through the organs of digestion; and we shall thus be enabled to explain why we are prompted, at stated periods, to relieve uneasy sensation in one organ by taking food, and in others by evacuating their contents.

But these points would require more ample discussion than our present limits will allow; and the arguments already adduced are sufficient to establish the unity of the motive power under both its modifications, and the subjection of both to the same general laws,

The next principle that demands our attention, is one still more extensive in its influence, equally applying to the organs of sensation and to those of motion. It regards the connection that prevails between the vital properties and the state of circulation.

The sentient faculty, as we have formerly seen, varies in different parts of the body at the same time, and in the same part at different times; so also does the motive power; and the relation which the former was shewn to bear to the state of circulation, is equally true with regard to the latter.

The most ample supply of red blood is met with in those parts most eminently endowed with the sentient faculty; and, in like manner, those parts of the muscular system most conspicuous for mobility, are most abundantly supplied with the same fluid.

Thus, the organs of animal life or voluntary motion, as the muscles of the limbs and trunk of the body, those of the neck, face and organs of speech, are of a florid red, and amply provided with vessels carrying arterial blood.

It is true, indeed, that the red colour is regarded by Bichât and others, as not arising from the blood that circulates in the extreme branches of the capillary vessels, but from a colouring matter actually combined with the muscular fibre by the process of nutrition, forming part of its substance.

The arguments, however, in favour of this view, are not very conclusive; for the easy separation of this coloured mat-

ter, by mere washing, rather negatives than confirms the idea of an intimate union, which it is conceived to support. At all events, the colour is an indication of the abundant supply of red blood, and of the complete manner in which it penetrates the muscular fibre, to become thus intimately combined with it.

Bichât not only states that this part of the animal economy has the most ample supply of red blood, but also that the red colour is most florid in those parts where the muscular energy is the greatest. And he further observes, that the muscles fade and become paler at that period of life when the muscular vigour begins to decline.

In the organs of automatic life, or the involuntary muscles, which have for the most part a smaller share of mobility, or a more limited range of action, the moving fibre is generally found white and colourless.

Thus the fibres of the stomach, intestines, and bladder, are for the most part colourless; and those involuntary organs which are exceptions in point of colour, are exceptions also in their mode of action, approximating more to the sudden and energetic contractions of the voluntary organs; as is the case with the heart and the diaphragm,

Here again, it is true, the opinion of Bichât may be advanced as an objection, who affirms that in some cases the involuntary receive more arterial blood than the voluntary muscles; and cites the numerous branches which the mesenteric artery sends to the intestines, as an example. But he afterwards admits that this appearance is to a certain extent illusory, as most of these branches only penetrate the coat of the intestine, to supply the mucous membrane within it. Now, it is not the number of vessels passing through, but the minute branches pervading and blending with the substance of the fibre that is here alluded to; and this is evidently the greatest in those parts where the colour is most conspicuous.

But the connection between the state of circulation and the muscular mobility, is rendered still more evident in the occasional fluctuations which the mobility is found to undergo; the power of motion, like the faculty of sensation, not only

varying in different parts, but also in the same part at different times; every change in the state of circulation producing a correspondent change in the degree of mobility, which increases as circulation in the capillary system increases, and diminishes as circulation diminishes.

The following instances may serve to illustrate the effects of impaired circulation, or diminished afflux of red blood to the capillary vessels of the moving organs.

Mere inaction, suffering the circulation to languish, frequently produces a kind of nervous tremor, resembling, and often ascribed to the effects of external cold. Extreme cold, which obstructs circulation, and thus impairs the faculty of feeling, also impedes the power of motion; hence the immobility, the tremors, and temporary paralysis, with which the limbs are affected when exposed to its influence. The constriction of the capillaries, produced by certain mental emotions, as fear, and denoted by the paleness and diminished temperature of the surface, is also productive of the same paralytic tremblings and transient loss of power in the limbs. The cold fit of an ague, which also retards circulation, and impedes the afflux of arterial blood to the capillary vessels, is likewise attended with the same numbness, tremors, and impaired mobility in the muscles. The shrinking of the capillaries attending sea-sickness, also causes a diminution of muscular energy, or an aversion to motion, noticed by every one who has experienced it. The weakness and immobility that result from other excessive evacuations, as hœmorrhage, violent purging, &c. equally arise from want of circulation in the capillary vessels, and subside as soon as circulation is restored. In some cases of actual paralysis, where the muscles themselves are the seat of the morbid change, want of circulation still appears to be the immediate cause of loss of power; and accordingly the means of restoration are all directed to the renewal of active circulation in the muscles. There are also forms of paralysis in which the sensorium, and not the moving organ, appears to be the seat of the morbid change; but here likewise want of circulation is the most probable cause of the diminution of power,

and serous effusion only a concomitant circumstance, otherwise paralysis should always accompany water in the head. In short, every cause that diminishes circulation in the capillary vessels, impairs the vital powers of the part in which this change occurs; and the muscular system, in common with others, is subject to this law.

On the other hand, whatever increases circulation, or determines blood more freely to the muscular system, is productive of a temporary augmentation of mobility, as the following instances will serve to illustrate.

When mere inaction, suffering circulation to languish, has impaired the powers of action, they are quickly restored by bodily exertion, which renews active circulation. On the same principle, the activity increases for a time, with increasing circulation, as we grow warm with action, And when the circulation is most active, before the sense of fatigue approaches, then the tendency to spasmodic contraction is also most prevalent, or the mobility greatest. When, on the other hand, the activity begins to decline, and the muscles acquire a rigid firmness, from permanent contraction or tonic spasm; then the circulation appears likewise to be impeded, the capillary vessels also partaking of the spastic state, and the limbs become cold and benumbed as well as stiff. It is now that frictions, fomentations, and warm bath, relax these vessels, and renew the powers of action, by restoring circulation. It is now that a cordial taken into the stomach renews the activity, by relaxing the constricted vessels, and diffusing a general warmth through the whole body. The subinflammatory state of the muscles consequent to over-exertion, also exhibits an inordinate degree of mobility in the moving fibre, arising from morbid circulation in the capillary vessels, which are manifestly relaxed and over-distended in inflammation; this over-distension being consequent to their previous contraction. The increased afflux of red blood attendant upon this relaxed state, occasioning a morbid increase of mobility, renders every effort of contraction inordinate, spasmodic, and painful.

This morbidly increased irritability, proceeding from aug-

mented afflux of red blood to the muscular system, gives rise to many of the most important phenomena of disease; and the knowledge of this principle affords a rational explanation of the relief obtained, in diminishing morbid irritability, by such means as tend to derive blood from the part inflamed, and allay increased circulation. In illustration of this principle, the following instances may be adduced.

The painful mobility, or spasmodic tendency of the muscles under inflammatory circulation, is the chief cause of the pain attending rheumatic affections. This occasions the pain that is felt at their origin and insertion, from stretching of the tendons, when the muscles, owing to their inordinate mobility, are thrown into spasmodic and painful contraction, upon the slightest effort to move. The acute pain in the side, from every full inspiration in pleurodyne or rheumatic inflammation of the intercostal muscles, which is often mistaken for pleurisy, is produced in this way, from the spasmodic contraction of the muscles, stretching their tendinous insertions between the ribs. The acute pain in the back, termed lumbago, proceeds from the same cause.

In parts less capable than voluntary organs are, of awakening mental perception, this increase of mobility commonly shews itself in the derangement of function it occasions.

Thus the spasmodic breathing and sense of suffocation in asthma, denote inordinate mobility, from increased circulation in the muscles of the bronchiæ and trachæa. The convulsive cough in pertussis may be connected with an increased mobility, from altered circulation in some other part of the respiratory organs. The distressing hiccough that prevails in inflammatory affections of the diaphragm, evidently depends upon morbid irritability, from increased circulation in that organ. The violent palpitation, with frequent and irregular pulse, in certain affections of the heart, arise from increased mobility in this organ, produced by augmented afflux of blood to the coronary system. The constant vomiting that attends inflammation of the stomach, the tormina and tenesmus that prevail in inflammatory affections of the intestines, shew the same increase of mobility attendant upon morbid circulation

in the organs of digestion. Frequent micturition indicates this change in an inflammatory state of the urinary bladder. And the spasmodic contractions of the womb, liable to occur from the sudden suppression of natural evacuations, denotes the same painful mobility, from increased circulation in the uterine organs.

In short, increase of mobility will be uniformly found to attend increase of circulation in the moving organs, both in the healthy and morbid states; the motive power, as well as the sentient faculty, bearing always, within certain limits, relation to the quantity of arterial blood circulating in the minute or capillary vessels of the muscular fibre.

The various modification of the moving power, as connected with peculiarity of structure in the organ; and the share which this cause appears to have in determining the degree of mobility peculiar to each, will be reserved for future consideration.

Art. II. *On the Heat evolved during the Coagulation of Blood. By* J. Davy, *M. D. F. R. S.*

Whether any heat is evolved during the coagulation of blood, is a question which has received opposite answers from different enquirers.

My friend, Dr. Gordon, is decidedly of opinion, that the phenomenon alluded to, is attended with a considerable elevation of temperature, amounting even to several degrees.

This opinion of his, I ventured to controvert, in my Inaugural Dissertation, published about two years ago. And Dr. Gordon did me the honour of replying to my remarks, in a paper published about eighteen months since, in Dr. Thomson's Annals, in which he maintains his former doctrine.

At present it is not my object to criticise his essay, but to offer some additional facts relating to the subject under dispute, which I had an opportunity of collecting on my voyage

to this place, in my way to India. My experiments were made on the blood of the turtle and shark, which last is extremely well adapted to the purpose, as its temperature approaches nearly that of the atmosphere; and on the blood also of sheep.

On the 15th of March, when our ship was in latitude 4° 9′ N. and longitude 19° 15′ W. by chronometer, at sun-set, a large shark was taken by means of a harpoon. As soon as it was brought on deck, whilst it was still alive, it was cut in two. The blood flowing in the great dorsal vein was 82°;* the surrounding thick muscles were 82,5°; the water of the sea was 80,5°, and the air 79°. Some of the blood was collected in a glass. In about two minutes it had firmly coagulated. During the whole time I watched the Thermometer immersed in it. The mercury sunk from 81,5° to 81°, and did not rise at the instant that the coagulation commenced, nor did it remain stationary whilst the coagulation was going on, but continued gradually sinking.

The day following another shark was taken. The same experiment was made with the blood, and a similar result was obtained.

On the 23d of March, when we were in latitude 2° 29′ S. and in longitude 24° 30′ W. a large turtle was killed, which had been caught about three weeks before, at the island of Ascension. The air at the time was 79°. The blood of the turtle flowing from the carotids was 91°. When collected in a glass it was 88,5°. The Thermometer placed in the midst of it, immediately began to fall, and continued falling gradually, without any sensible interruption, whilst the blood was coagulating.

Since I have been at Cape Town, I have repeated my experiments on the blood of sheep. To enter into any details of them would be superfluous, since the results they afforded

* This result is an additional evidence that venous blood is of a lower temperature than arterial; a circumstance which I have endeavoured to prove by numerous observations contained in the Thesis already alluded to.

agreed perfectly with those already described. The air being about 60°, and the blood when drawn about 100°, it continued cooling whilst its coagulation was going on, so that when the coagulum had formed, its temperature was diminished, in between two and three minutes, about one degree and a half.

From these experiments, the obvious, and it appears to me, the unavoidable conclusion is, that which I had before adopted in my Thesis, and which had been first drawn by Mr. Hunter, viz.—"That during the coagulation of blood, there is no sensible evolution of heat."

It now only remains for me to reconcile the fact, (if I may venture to call it by that name), with the well established principle, that change of temperature is the necessary consequence of the change of form of bodies in general; and to suggest a reason for the difference of Dr. Gordon's and my own results.

To accomplish the first, there is little difficulty; and the explanation which I proposed in my Thesis, I shall again offer, as it seems to me quite adequate to the purpose.

Since, during the coagulation of blood, a part of it passes from the liquid into the solid state, there should be, according to theory, some increase of temperature. But since this liquid part, the fibrine, which becomes solid, is so small as to amount only to about $\frac{1}{50}$ of the whole quantity by weight; and since the coagulation is not an instantaneous, but a slow and gradual effect, it appears to me as necessarily to follow, that the heat produced must be too slight to affect sensibly the Thermometer. This granted, which may be proved to demonstration, the anomaly vanishes,—this fact no longer opposes the general principle.

The difference between the results of Dr. Gordon's experiments and my own, has arisen perhaps from the different modes in which our experiments were made. Dr. Gordon, I think, kept the bulb of his Thermometer near the bottom of the vessel containing the blood, and when this fluid began to coagulate towards the surface, he drew the instrument up. On the contrary, in all the experiments I have detailed in this paper, the Thermometer was not allowed to remain stationary;

it was gently moved from one part to another, so that the whole might be kept of the same temperature till the coagulation commenced: for when the blood is viscid, and the vessel deep, the surface on the part last drawn is warmer than that below, and when shallow, the bottom is warmest, as I have frequently observed in my experiments, and as I have remarked in my Thesis, as a source of inaccurate observation.

I could wish to enter more into detail upon the subject; but at this distance from Europe, and consequently from every scientific journal and scientific work, it is out of my power. To Dr. Gordon's well-known candour and liberality of mind I must trust for pardon, for any oversight I may have committed in the consideration of his paper. I am, however, confident, that if Dr. Gordon will repeat the experiments I have described, he will obtain the same results, and be satisfied with Mr. Hunter's original conclusion.

Cape of Good Hope,
May 24th 1816.

Art. III. *An Account of an atmospheric Electrometer. By* Francis Ronalds, *Esq.*

Although atmospheric electricity, from the period of its first discovery, has always been esteemed an important subject of inquiry, and has been the object of much diligent and valuable investigation, it is regretted that a register of careful observations upon it, do not accompany those made in various places, on the pressure, temperature, humidity, &c. of the atmosphere.

The difficulty, if not the impossibility of constructing a correct atmospherical electrometer, and the great inconvenience attendant on the use of the least objectionable kind of instrument, (which perhaps is the "exploring wire" of Father Beccaria), are no doubt the causes of this omission.

The known difficulty seems to be that of preserving the glass supports or insulators of the wires or rods in such a state, that as far as they are concerned in insulating them, they may do so uniformly; but no attempts to effect this object have hitherto succeeded; probably because the deposition of moisture upon them, from the surrounding air, has not been totally prevented. Mr. Read imagined, that if his insulators could be constantly kept in "due temperature," his rod would be always electrified; but he feared, that as this could only be accomplished with the aid of common fire, it would be very difficult, in so large an apparatus, to apply neither too much nor too little. In the apparatus described below, the temperature of the insulator may be (constantly, or whenever an observation is made) raised a little higher than the surrounding air; and consequently it seems reasonable to conclude, that the deposition of moisture on its surface is extremely small, and unappreciable by its conducting power.

That the difficulty is thus obviated in a great measure, at least is evident, by comparing it with those kinds of insulators which are not warmed; but it would be going too far to say, that glass or any other substance, whose temperature is raised ever so little, is not thereby rendered more conducting. One or two other slight improvements on atmospheric electrometers are attempted, and the advantages of several different kinds are combined, so as to render it convenient and applicable to general use. But Mr. Ronayne's simple method, wherein no insulation is required, would no doubt be by far the most satisfactory, if it could be adapted to small intensities.

ABCD (Plate VI,) is the front view of a strong box, standing on four legs, and provided with a glass door. E is the glass support, which perforates the bottom of the box, and also the piece of wood F. The sides of these perforations are lined with strong leather. GGG are bolts, which also pass through the bottom of the box and the piece F, and have nuts, by means of which, and in consequence of the conical figure of the glass, the support is firmly secured in its position, without danger of being broken. That part of the support is hollow, which is marked

with dotted lines, the thickness of glass is about a quarter of an inch at the opening, and the upper part is covered with sealing wax. Beneath the support is a small spirit lamp H, protected from wind by the chimney I, in which only one small thread of cotton is used, to convey spirit to the flame, and it is only lighted when my hygrometer stands beyond 50°. The upper end of the support is furnished with a strong brass socket, to receive the brass stem K, which passes through an aperture of three inches diameter in the top of the box, and to which is attached the ball L; this is pierced to receive the lower joint of a long bamboo fishing rod M, which inclines at an angle of about 45° to the support. The upper joints are covered with foil. The strong wire N passes through an aperture of two inches in the partition O, and carries a pair of forceps, and gold leaf electrometer P. Opposite to the end of this wire, is seen the end of another wire Q, which screws very exactly through the side of the box, and, by means of the milled head, may be adjusted to any required distance from the wire N. The chain R forms a metallic communication between the wire Q and the earth, so that a Discharging Electrometer is thus provided, to measure correctly the length of sparks, and to guard against the effects of violent discharges. Slips of tin foil are pasted upon the side of the box, and of the partition opposite the gold leaves. On the back of the box, at the same height as the lower ends of the gold leaves, is pasted an arc of paper, divided into twenty parts, not equal, but according to the method adopted by Saussure, (Voyages, Tom. 2, P. 204); and another arc, divided into twenty corresponding parts, is pasted on the glass front of the box, exactly opposite to the former, so that the exact degree of electrical tension is ascertained, by bringing the eye into a line with one of the gold leaves, and the two opposite divisions of the arcs.

A pair of very small balls, turned from box-wood charcoal, are suspended from a hook S, at the end of the fishing rod, by the finest silver wire, six inches long, or, in lieu of them, the electrometer Fig. 2, which serves to note the higher intensities, such as of rain, heavy clouds, hail, snow, &c. which,

in an open situation, being so great as to destroy the gold leaves, they can be easily removed.

The apparatus, as represented in the figure, being placed upon a table, in the highest room of a house, and the fishing rod thrust out of the window, is in a proper state for examining the usual atmospheric electricity of serene weather. By withdrawing the rod and stem MK, and closing the aperture in the top of the box with a proper cover, the interior can be preserved from dust, and by the handle T, can be removed to any new position. If it is used in the open air, the rod can be placed vertically in the socket, without the stem K; but in this case, the gold leaves are apt to be a little agitated by wind, if it should be strong, and the charcoal balls may be hung on the wire N in their stead. Sign. Beccaria took particular notice of the "frequency" of electric signs in his wire, or the rates of time at which fresh signs arose, after he had touched it, which, as they are proportional to the degree of atmospheric moisture, he very justly considered deserving of peculiar attention. It is principally for this purpose that fine silver wire and hard charcoal balls are perhaps preferable materials for electrometers, to threads of any kind, and pith or cork balls, since the former, by becoming very dry sometimes, and then not conducting equally well, diverge more slowly than they ought, and are consequently equivocal indicators of this property of frequency; and the practice which has been recommended by some electricians, of moistening them with salt water, in order to render them better conductors, not only makes them objectionable on account of their liability to twist, bend, and shorten, but because their weight is not immaterially varied by this process. Pith or cork balls, when not new, are apt to stick. Fig. 3 is a convenient instrument to be employed in the construction of electrometers of silver wire and charcoal balls, which is, as Mr. Cavallo observes of those made with cork balls and silver wire, is very difficult in the usual way. ABCD is a bow of steel wire, having a hook at each extremity. After the ball has been threadled on the silver wire, and rings formed at each end, it is *very gently* stretched in this bow, by passing the

hooks through the rings, and shoving it forward, with the thumb placed against the end of the tongue, near the handle, which tongue is thus made to open wide, by pressing the screw E on each side. Then the screw is turned a little farther into the piece F, in order to secure it firmly in its place. The fine wire is now carefully laid upon a piece of iron, heated a little below redness, which renders it perfectly straight, and it may be removed from the bow, and hung upon one of the rings of the piece of brass G.

Art. IV. *An account of the Shepherds of the Landes, in the South of France. In a letter to the Editor, from* Thomas Maynard, *Esq.*

London, November 12*th* 1816.

My Dear Sir,

The accompanying figure (see Plate VII.) represents a shepherd of the Landes, or desart in the South of France. This tract of country lies between the mouths of the Adour and the Gironde, along the sea coast, and, according to tradition, was once the bed of the sea itself, which flowed in as far as Dax.* Through this district the guards marched from Bayonne, at the conclusion of the war in June 1814, to embark at Bourdeaux. This afforded us an opportunity of seeing a country seldom visited by travellers. It is a bed of sand, flat, in the strictest sense of the word, and abounding with extensive pine woods. These woods afford turpentine, resin, and charcoal, for trade, as well as a sort of candles, used by the peasantry, made of yarn dipt in the turpentine. The road is through the sand, unaltered by art, except where it is so loose

* This is not the only change. The river Adour also has altered its course, the old bed of the river is marked by an extensive lake and morass to the north of the present course, and along the high road to Dax.

and deep as to require the trunks of the fir trees to be laid across to give it firmness. The villages and hamlets stand on spots of fertile ground, scattered like islands among the sands. The appearance of a corn field on each side of the road, fenced by green hedges, a clump of trees at a little distance, and the spire of a rustic church tapering from among them, gave notice of our approach to an inhabited spot. On entering the villages, we found neat white cottages, scattered along a bit of green, surrounded by well cultivated gardens and orchards, and shaded by fine old oaks and walnuts. Through the centre of the village, a brook of the clearest water was always seen running amongst meadows and hay fields, and forming a most grateful contrast to the heat and dust of the sandy road. It was between the villages of Castel and La Buharre that we first saw these shepherds, mounted on stilts, and striding, like storks, along the flat. These stilts raise them from three to five feet: the foot rests on a surface, adapted to its sole, carved out of the solid wood; a flat part, shaped to the outside of the leg, and reaching to below the bend of the knee, is strapped round the calf and ankle. The foot is covered by a piece of raw sheep's hide. In these stilts they move with perfect freedom, and astonishing rapidity; and they have their balance so completely, that they run, jump, stoop, and even dance, with ease and safety. We made them run races for a piece of money, put on a stone on the ground, to which they pounced down with surprising quickness. They cannot stand quite still without the aid of a long staff, which they always carry in their hands. This guards them against any accidental trip, and when they wish to be at rest, forms a third leg, that keeps them steady. The habit of using the stilts is acquired early, and it appeared that the smaller the boy was, the longer it was necessary to have his stilts. By means of these odd additions to the natural leg, the feet are kept out of the water, which lies deep during winter on the sands, and from the heated sand during the summer: in addition to which, the sphere of vision over so perfect a flat is materially increased by the elevation, and the shepherd can see his sheep much farther on stilts than he

could from the ground. This department of France is little known, and if what I have here related be as new to your readers as it was to me at the time I first saw them, this description may possibly afford them some amusement.

I remain, Dear Sir, &c. &c.

THOs. MAYNARD.

ART. V. *Traité de Chimie, élémentaire, théorique, et pratique, par* L. I. THENARD, *&c. &c. &c.* 4 *Tomes, Paris,* 1813, 1814 1815, 1816.

SINCE the publication of the voluminous and inaccurate "Système des Connoissances Chimiques" of M. Fourcroy, no systematic work on Chemical Philosophy, has appeared in France. We are glad, therefore, to direct the attention of our readers to the present work of M. Thenard, hitherto best known as the coadjutor of M. Gay Lussac, to whom he very unaffectedly dedicates his book.

The works of Drs. Thomson and Murray, are regarded as the standard chemical systems of this country—the historical accuracy and abundant references of the former, rendered it most valuable to the experienced chemist, while the Dædalian perplexity of its arrangement, made it quite inaccessible to the student. Dr. Murray's work, less copious but more clear, was advantageously resorted to by the beginner, while its perspicuous and elegant style rendered it at least agreeable to the proficient. But these works may be regarded as in a great measure obsolete. Since the authors arranged their materials, electricity has acquired new importance; the alcalis and earths, and the boracic acid, have been decomposed, and have afforded new combustible principles, a new supporter of combustion has been discovered, our views respecting the constitution of acids have been new modelled, and even the fundamental doctrines of chemistry have been modified by the discovery of the law of definite proportions. Under these

circumstances, a System of Chemistry from the pen of one who has been actively engaged in promoting the modern improvements of the science, will be eagerly and scrupulously examined by his scientific brethren.

Of the four volumes of this work, the two first relate to inorganic substances—the third to organic bodies, and the fourth to chemical analysis. There is also a copious index, not common in French works: an alphabetic description of chemical apparatus: and thirty-two plates of retorts, receivers, funnels, furnaces, and the like, of which one-fourth the number would have been more than sufficient. They are, however, neatly, clearly, and economically executed.

The first chapter is entitled, "*Notions sur la Nature des Corps, et sur la Force qui unit leurs Parties constituentes.*" It enters immediately, but superficially, upon the important subject of attraction, which is considered as influencing the cohæsion and form of bodies, and afterwards, under the title *Affinity*, as relating to their composition.

Affinity is modified, 1st, by the the relative quantities of the combining bodies; thus, if we suppose three compounds, the first consisting of one proportion of A + 1 B, the second 1 A + 2 B, and the third, 1 A + 3 B, one proportion of B will more easily be separated from A, in the third than in the second, and in the second than in the first case.

2. By their previous states of combination.

3. By cohæsion.

4. By caloric.

5. By the electrical states of the bodies.

6. By specific gravity. This we do not quite understand, as applied to chemical combinations. "When the specific gravity of two bodies differs, they have a tendency to separate, and if their mutual affinity is weak, they cannot combine; *as oil and water.*"

7. By pressure. The solution of gasses by fluids—and the retention of carbonic acid by lime at high temperatures, are here adverted to.

The *laws* of combination are next considered. There are two distinct kinds of combination. 1. Those bodies which

exert very powerful mutual attractions combine only in certain proportions; and if two bodies A and B unite in two proportions, so as to form the bodies C and D, the proportion of B in C will be to that of B in D as 1 to 2, or 2 to 3, or some similar simple ratio.

In these cases of combination, the properties of the compound are much at variance with those of its constituents—common salt results from the union of two caustic bodies—sulphur, by combining with one of the elements of the atmosphere, produces a compound having an acrid smell and taste.

2. In the second cases of combination, the bodies have less attraction for each other, and they combine within certain limits, in all proportions; the properties of the compound too, are little different from those of its constituents. Such are the solutions of salt and of sugar in water.

Some of those doctrines of Berthollet which have been so well refuted by Davy, are next advanced; but as the author reserves their discussion for a future part of his work, we shall gladly follow his example, and proceed to the second Chapter, which treats of *imponderable substances*, which, we are told, are four in number.—1. The fluid of heat, or caloric.—2. The fluid of light; 3. The electric fluid; 4. The magnetic fluid.

We should have expected that the author would have here entered into those interesting discussions concerning the materiality of these agents, which engaged the attention of Bacon and of Newton, and that the evidences on both sides of the question would have been brought forward and compared. The question is concisely eluded in the following paragraph. "Leur impondérabilité rend leur existence douteuse; quoi qu'il en soit, nous en parlerons comme s'ils étaient des corps réels, mais nous n'affirmerons rien à cet égard, et nons préférons cette hypothèse à toute autre, parce qu'elle est plus commode pour exposer les faits."

In this we are by no means of M. Thenard's way of thinking; for although some of the phænomena of heat may be

most easily explained upon the *material hypothesis,* others are more consistent with 'that view of the subject which consider *motion* as their immediate cause.

Nothing is more repugnant to the progress of philosophy than this hasty assumption of easy hypotheses; it makes us believe ourselves wiser than we are; and tends to the substitution of words for things.

M. Thenard commences the subject of heat, with an account of the phenomena of radiation, in which the admirable researches of Leslie and Rumford are clearly though briefly detailed. The ensuing sections treat of the equilibrium of heat, and of its passage in solids, fluids, and gases. Water is a very bad conductor of heat, "hence the surface of the sea and lakes is in a hot summer much warmer than the deeper parts." This is an unhappy illustration; the warm water being specifically lighter than the inferior cold water, floats upon its surface. In this part of his work the author is too brief for a systematic writer.

The interesting experiments of Drs. Thomson, Murray, and Hope, on the conducting powers of fluids, are not noticed, and conclusions follow each other without any reference to the experiments which establish them—this is not right in a system of chemistry.

The section which treats of dilatation or expansion is more full. The important discovery of Gay Lussac and Dalton respecting the similar expansion of different gases and vapours for equal increments of heat, is detailed at length. Thermometers are next described, and a long account is given of Wedgwood's pyrometer. The author does not seem aware that Sir James Hall's researches have invalidated all that has been done with this instrument, simply by showing that the pieces of clay contract as much when submitted for a long time to a red heat, as when exposed for a shorter time to a white heat. The observations on the construction of the mercurial thermometer are minute and correct, and are succeeded by a description of Mr. Leslie's differential thermometer.

In the account of the effects of heat upon the state of bodies, we are told of the experiments of Dalton, Clement Desormes, G. Lussac, Papin, and others; but of Black we hear not a word, though he was doubtless the founder of a beautiful department of philosophy relating to these changes, and his original researches are not merely equally illustrative, but more simple and satisfactory, than those of his favoured successors.

Heat is next considered as effecting decomposition; and the succeeding section relates to contraction by cold; but here we having nothing either new or pertinent.

The merit of shewing that different substances *in the same state*, such as different liquids, gases, and solids, contain different proportions of heat, though of one thermometrical temperature, is given to Dr. Black, though Boerhaave really began the investigation. The section on specific heat is somewhat confused by an unnecessary reference to the different quantities of heat in the same substance in *different states*, which had been before discussed. The modes of ascertaining the specific heat of bodies, by mixing them at different temperatures, and the method suggested by Wilcke and Mr. Leslie of ascertaining their relative rates of cooling when carried from a warm to a cold atmosphere, are scarcely hinted at; but much is said of the calorimeter invented by Lavoisier and La Place, intended to measure the specific heat of different bodies by the different quantities of ice which they are capable of thawing, in a given time—for instance, whilst cooling from the boiling to the freezing point of water. It was the ingenious Wilcke of Stockholm, who first thought of thus ascertaining the specific heat of bodies, but he gave it up on account of various inaccuracies to which it is liable, and which, with many others pointed out by Mr. Wedgwood, (Phil. Trans. vol. 74.) and often witnessed by ourselves, render this calorimeter an inaccurate and unmanageable instrument, and throw the shade of error upon all results obtained by its means. The description and plate of this instrument have been copied from one system of chemistry to another, till we are tired of seeing them—he who will take the trouble of using it,

will find it impossible to get two results alike. It is time that this and other similar pieces of machinery should be left out of systems of chemistry—they only perpetuate error.

An account is subjoined of a new calorimeter, invented by Count Rumford. It consists of a cistern of water through which a tube passes horizontally; to one of its extremities is attached an inverted funnel. The flame of wax, spirit, or other substance, the heating power of which is to be ascertained, is placed under this funnel, and the effect measured by a thermometer immersed in the cooler, or cistern. We have used an apparatus of this kind, but it is worth nothing; for the condensation of water, and the deposition of carbonaceous matter upon the funnel and in the tube, prevent any accuracy of results. M. Thenard next considers the sources of heat—solar and terrestrial. The first paragraph of this section announces Dr. Herschel's discovery of heating rays of less refrangibility than the calorific rays. The second states, that heat is produced by compression; and the third, that it is elicited by combination—here we are referred to a future part of the work, which treats on combustion.

The next section is entitled "du Froid," and the production of cold by the liquefaction of solids, and the evaporation of liquids is mentioned, rather than discussed. Mr. Leslie's beautiful experiment of the freezing of water by accelerating its evaporation in vacuo with the help of a surface of oil of vitriol, is now described. We cannot but think that the whole of this part of the Chapter on caloric, is badly managed: though brief, it is perplexed. Why, for instance, confuse the phenomena of latent, with those of specific heat? or why not notice the production of cold by liquefaction and evaporation when discussing the effects of heat upon the state of bodies, instead of just hinting at them in a section on *cold.* The analytical and synthetical results would thus have been conveniently opposed to, and compared with, each other.

In the article entitled, "Des Propriétés chimiques de la Lumière," we are hastily informed that the violet rays are less capable of producing heat than the red; that Dr. Herschel found the greatest heating power of the spectrum to exist

just out of the red ray; that Scheele ascertained the peculiar *chemical* powers of the violet rays, and that Wollaston, Ritter, and Bockman, discovered the concentration of these rays to exist in the space beyond the violet ray, and entirely out of the calorific spectrum. Something is said about the light of the moon, and the identity of light and heat; and this, really and literally, is all the information which M. Thenard has thought fit to communicate upon the subject of *light*.

But the division of this chapter, relating to electricity, is yet more lamentably brief. Here, if any where, the author should have been copious and minute;—upon this subject the majority of his readers want information, and no chemist, who has aspired to the name of a systematic writer, has hitherto treated it in full: we hoped, therefore, to have found in this work of M. Thenard a general critical view of those doctrines which have of late conferred a new aspect on chemical science, and to have seen those gaps filled up which the less presuming authors of mere elementary works have had some excuse for leaving. The first paragraph on electricity runs nearly as follows.—We know that all bodies contain a certain quantity of electric fluid, which may be regarded as consisting of two different fluids, the one vitreous or positive, the other resinous or negative; that while these two fluids remain combined, no electrical effects are manifested, but whenever either becomes free, it renders itself evident, by communicating the power of attraction and repulsion to the bodies which receive it—they become *electrified*. Two bodies electrified by the same fluid, repel each other; but if one body be charged with the vitreous fluid, and another with the resinous, that is, if they be dissimilarly electrified, they then attract each other. If we now suppose two molecules of a compound, A and B, to be positive and negative, it follows that these molecules might be separated by presenting to them sufficiently energetic electrical powers; that a positive body would repel A and attract B, and that a negative body would attract A and repel B, and consequently effect their separation; provided always the separating powers are greater than those which hold the molecules together.—All this may

be readily allowed, for we do not propose to stop here to ask whether electrical phenomena depend upon one fluid or two fluids, or upon any fluid at all; we grant all the author demands; but we cannot follow him in the next leap at a conclusion. "Telle est précisément la manière d'agir de la pile Voltaique," the theory of which is next explained. We have long considered a satisfactory theory of the Voltaic pile as one of the great desiderata in the higher departments of chemical philosophy. The theory given in the pages before us we consider as by far the best, except indeed, that, by the unfortunate substitution of the word *conductor*, for *imperfect conductor*, the whole is rendered confused, and unless thus corrected, we in vain look for the cause of accumulation in the pile. Nothing is here said of the strange influence of chemical action, in augmenting the quantity of electricity, and the reason assigned for the prodigious augmentation of effect, produced by substituting dilute nitric acid for salt water, in Volta's pile, is, "que parmi les acides, c'était l'acide nitrique qui produisait le plus d'effet, *ou transmettait le plus vite* l'électricité d'un élément à l'autre." The fact is, that the rapidity of transmission here resorted to, is no adequate explanation of the increase of effect. Solution of potash is as good a conductor as solution of nitric acid, and yet it does nothing towards increasing the electrical effects. Chemical action is wanted for this purpose, and where it is intense, as Dr. Wollaston has well shewn, the *quantity* of electricity rendered apparent by a pair of plates that may be dipped into a thimble, is greater than has yet been generated by the most powerful electrical machine, unaided by means of accumulation.

A long account is given of the "Construction d'une pile à plaques de petites dimensions"—and we must again express our regret that the pages here devoted to directions useful only to the carpenter and instrument maker, were not filled with more important matter; that the general laws of electrical action are wholly passed over; that the necessary distinctions between *quantity* and *intensity* are undefined; that De Luc's column, as illustrating the *modus operandi* of the

pile, is unnoticed; and that the important relationship between chemical and electrical changes is scarcely mentioned. In a system of chemistry, all this would have been new ground, and much credit might have been gained by carefully traversing it. This second chapter concludes with a brief section on magnetism, and we take leave of the history of imponderable bodies.

If this system of chemistry be written for the benefit of the student, we consider this part of it as unwarrantably deficient; the clearest notions should be gained of the proportions and powers of matter, or, as our author has it, of the chemistry of imponderable bodies; and to these the pupil's attention should be steadily directed at the outset of his studies; it is here that he must get the light that is to lead him on; we are sorry, therefore, to find the whole dispatched in little more than a hundred pages,

In the third chapter, the subjects of nomenclature and arrangement are treated of. The improvements in the nomenclature of chemistry, devised and executed by the school of which Lavoisier was the head, should always be gratefully acknowledged and remembered; they not only tended to banish the fanciful absurdities of alchemy, but gave a steady and philosophic aspect to the science; and the rapidity with which they were adopted, not merely by the French chemists themselves, but by their less pliant brethren in Germany and in England, was no small proof of their excellence, and of the inconvenience caused by the want of some fixed nomenclatural principles. Like all other extensive innovations, they were carried too far, and deemed too perfect; but these are matters of little import when contrasted with the benefits they produced. Nor has any system of nomenclature been subsequently devised, not liable to similar, and more weighty objections, at least where it relates to compound bodies. The terms *chlorine* and *iodine* are excellent; they refer to inalienable properties of the bodies so called, and can never involve the perplexities which modern discoveries have heaped upon the once unobjectionable term *oxygen*.

In speaking of the arrangement to be adopted in regard to

ponderable bodies, oxygen is placed at the head of the list; it is followed by the simple and compound inflammables, and by the oxides and acids, and their numerous compounds. The operations of metallurgy are considered apart, and followed by the chemistry of the vegetable and animal kingdoms. A general view of the art of chemical analysis completes the work.

The following order is observed in the examination of individual substances.—1. Physical properties. 2. Chemical properties. 3. Different states in which they occur in nature. 4. Method of obtaining them pure. 5. Their composition. 6. Uses. 7. Abridged history of their discovery, &c. Oxygen stands alone as the supporter of combustion, and the author is quite silent concerning the pretensions of chlorine, to rank with oxygen, and to be regarded also as a simple body. It was to be expected that, as Sir H. Davy's Paper upon the nature of the *oxymuriatic acid* was published in 1810, and as Gay Lussac and Thenard had previously cast doubts upon Berthollet's hypothesis respecting its composition, in the 2d volume of the Mémoires d'Arcueil, that something at least would have been here thrown out upon this subject; instead of which, the oxygenated muriatic acid is described afterwards among the "*Corps brulés binaires,*" and the muriatic acid is noticed under the improper and hypothetical term of "acide hydro-muriatique," *parceque il contient le quart de son poids d'eau, ou de principes de l'eau.* We hear nothing of *chlorine* till the end of the 4th volume, where, among the "Additions," is an article entitled, "Sur l'explication des phénomènes que présente le gaz oxymuriatique ou le gaz muriatique oxygéné, dans *l'hypothèse* qui consiste à regarder ce gaz comme un corps simple." It seems to us, that the term *hypothesis* should have been applied to that view of the subject which regards oxygen as a component of chlorine, and that the explanation here given, is the simple statement of facts, as founded upon actual experiment and observation. We are tired of hearing persons who ought to know better, assert that *either hypothesis* may be assumed. It is this vacillancy respecting chlorine that has spoiled all that part of

Thenard's book which relates to it; it has broken in upon his general arrangement, which would have been more perfect had he inserted chlorine after oxygen, or even after nitrogen; for, as he and Gay Lussac term its compounds "*Chlorures*," it is to be presumed, that they regard it as rather belonging to that class—although this notion must have been somewhat shaken by the recently discovered analogies between iodine and chlorine; and given a sketch of Berthollet's *hypothesis* of its nature, among the "addenda" at the end, or what perhaps would have been preferable, said nothing whatever concerning those errors of the French school.

The chapter on oxygen contains a section on combustion, in which the incorrect axiom is held out, that combustion always consists in the combination of the burning body with oxygen, and that the heat and light which result are derived from the gas. To say nothing of the numerous instances of combustion, in which it *cannot be proved* that oxygen is present, this hypothesis does not apply even to those cases where it is; we have no satisfactory explanation, for instance, why hydrogen, which condenses during combustion more oxygen than any other body, does not cause the evolution of $\frac{1}{1000}$ part of the light which is produced by burning phosphorus, though it is itself gaseous. But it would be endless to repeat all that has been said upon this often argued point; we therefore refer our readers to the sensible remarks of Dr. Thomson, (Syst. of Chem. 3d edit. Vol. 1, p. 589); and more especially, to Sir H. Davy's enlightened and unbiassed observations on the subject, (Elem. of Chem. p. 225). "All later researches," he says, "seem to shew that no *peculiar* substance, or form of matter, is necessary for the effect (combustion); that it is a general result of the actions of any substances possessed of strong chemical attractions, or different electrical relations; and that it takes place in all cases in which an intense and violent motion can be conceived to be communicated to the corpuscles of bodies. We have long been surprised at the industry and solicitude with which many of the absurdities and contradictions of the French school of chemistry, (we

speak of it in Lavoisier's time), have been palliated, evaded, and propagated, by men whese scientific character and abilities should have excited them to the nobler endeavour of developing the naked truth, and of freeing facts from the shackles of hypothesis. Too much credit cannot be given to Sir H. Davy, for the manly and impartial tone in which he used to treat this subject in his Lectures in the Royal Institution, and for the calm, though convincing remarks scattered through his "Elements of Chemistry," upon the danger of substituting plausibility for truth, and of thoughtlessly adopting hypotheses which are at variance with the results of experiment.

M. Thenard has again touched upon the theory of combustion, in a subsequent section, on atmospheric air, and has there done some justice to Jean Rey of Perigord, who was the first to demonstrate the influence of the air upon the combustion of metals—a writer whose works have been singularly neglected and unnoticed by those who have aimed at conferring upon Lavoisier the sole merit of conceiving and bringing forth the "new theory of combustion;" but of our illustrious countrymen, Mayow and Hales, no mention is made in the *historique* of this subject.

The simple non-metallic combustibles are discussed in the following order.—1. Hydrogen. 2. Boron. "On ne le connait que depuis 1809: il a été découvert par M. Gay Lussac et Thenard." This is incorrect; it was discovered by Davy in 1808. (See Phil. Trans. 1808, p. 343.) 3. Carbon. "On ne trouve le carbon pure que dans le diamant"? Newton, in his conjecture concerning the combustibility of the diamond, was anticipated by Boetius de Boot: Boyle too had previously ascertained the fact, and so had the Tuscan philosophers. 4. Phosphorus. 5. Sulphur. "Il est évident que tout le calorique et toute la lumière qui se dégagent dans la combustion du soufre (dans le gaz oxygène) proviennent du gaz oxygène." Yet there is not only no solid formed, but the sulphur becomes gaseous, and the volume of the oxygen remains as at first. 6. Azote. The term *nitrogen* appears preferable. It was not discovered by Lavoisier in 1773, but by Priestley and Rutherford in 1772.

The metals, amounting, according to the author, to 38, occupy the next section; they are subdivided as follows:

A. Metaux présumés.—1. Silicium. 2. Zirconium. 3. Aluminium. 4. Yttrium. 5. Glucinium. 6. Magnesium.

B. Metals which absorb oxygen from the air even at high temperatures, and rapidly decompose water at common temperatures.—1. Calcium. 2. Strontium. 3. Barium. 4. Sodium. 5. Potassium.

C. Metals which absorb oxygen at high temperatures, but which only decompose water at a red heat.—1. Mangànese. 2. Zinc. 3. Iron. 4. Tin.

D. Metals which absorb oxygen at high temperatures, but which do not decompose water at any temperature.—1. Arsenic. 2. Molybdenum. 3. Chrome. 4. Tungsten. 5. Columbium. 6. Antimony. 7. Uranium. 8. Cerium. 9. Cobalt. 10. Titanium. 11. Bismuth. 12. Copper. 13. Tellurium. This subdivision is again subdivided into *acidifiable metals*, including the five first; and *oxydable*, including the eight last.

E. Metals which absorb oxygen at certain temperatures only, and which do not decompose water.—1. Nickel. 2. Lead. 3. Mercury. 4. Osmium.

F. Metals which neither absorb oxygen nor decompose water at any temperature.—1. Silver. 2. Palladium. 3. Rhodium. 4. Platinum. 5. Gold. 6. Iridium.

This arrangement of the metals, though one of the best we have met with, would perhaps be improved by inversion. The description of the general properties of the metals is extremely good, but the particular details are deficient, hurried, and ill arranged.

M. Thenard has here fallen into the fault of many chemical writers, who, to accommodate certain whims in regard to arrangement, so dismember the subjects of investigation, as to render it utterly impossible to find any point whence they may be viewed in connected order. If we desire to learn the history of any one of the simple bodies, we are obliged to search for its fragments in every corner of each of the volumes, and to encounter the tiresome operation of putting

them together, which, after all, produces a clumsy and unhandy whole. Let us take one of the metals as an instance. Iron—its physical properties are described at page 242, Vol 1. In the same chapter we are told that it combines with oxygen, and how it may be burned in that gas; but to learn further the composition and properties of the oxides, reference must be made to Vol. 2, p. 72. The sulphurets are described in Vol. 1, page 376, its alloys at p. 418, its extraction from the ores, very imperfectly given in Vol. 2, p. 703, its distinctive characters in Vol. 4, p. 57, and its salts are most ingeniously scattered throughout all the four volumes, so as considerably to exercise his patience who would endeavour to find them.

Having, then, dismissed these brief prolegomena touching the metals, we come next to the compounds of the simple non-metallic combustibles with the metals. The hydrurets, *borures,* carburets, phosphurets, sulphurets, and alloys, succeed each other; but they would have appeared to much greater advantage under the head of the respective metals. The greatest violence, however, has been done to the "*corps brulés binaires.*" Water, oxide of carbon, and of phosphorus, and the two oxides of nitrogen, are pent up in the first section; and the second contains the acids. It would surely have been more convenient and philosophical, if, in treating of phosphorus in the former part of the work, its oxide, acids, &c. had been there described; and so in regard to the other bodies.

The second volume opens with the history of the metallic oxides; among which, the earths are properly, but ammonia improperly, arranged: the metallic acids are considered apart at the end of this chapter.

The 8th chapter treats of the reciprocal action of the oxides. The hydrates, the combinations of the oxides of the common metals with the alcalis; glass, pottery, earthenware, and cements, here make their appearance.

In the 9th chapter we are informed of the action of the acids upon each other: in the 10th, of the reciprocal action of the oxides upon the acids; among which, the *dilute* acids

are most unconscionably poured in, because they contain water, which is an *oxide of hydrogen.*

The 11th chapter treats of the reciprocal action of the acids and the metallic oxides, and consequently embraces the very important class of metallic salts; and the 12th, and concluding chapter of this part of the work, describes the processes by which the metals are extracted from their ores, and brought to the state in which we meet with them in commerce and the arts.

The observations on the metallic salts, contained in the 11th chapter, are among the most valuable we have met with; indeed, the whole of this part of the work is so well executed, as to make us wonder that the others are faulty as they are. Even here, however, there are some remarks with which we can by no means accord. We should have been better pleased, for instance, to have found the salts of mercury annexed to the section describing the metal and its oxides; to have had the metallic oxide as the basis of the genus; and do not see the weight of the objections to this plan urged by the author, Vol. 2, p. 300. In this part of the work too, there are some well conceived tables—not perhaps very useful, but rather curious, and calculated to expose the general characters of the salts. Such are the tables of the colours of the different salts, of their tastes, of the colours produced in them by sulphuretted hydrogen, of their reduction by the immersion of metals, of the combination of salts with each other, &c. In short, the section of this work, entitled, "Des Sels en général," is a valuable contribution to chemical science; and had not this article already extended to its due boundaries, we should have been inclined to have enlarged our critical observations upon the important doctrines here discussed. "De graves erreurs ont été commises; mais enfin ils ont disparu pour faire place à de grandes vérités: Ces vérités nous ont été enseignées surtout par Lavoisier, Richter, M. Berthollet, M. Davy, et M. Berzelius." In assigning to these exalted names their respective merits, the author tells us, that Lavoisier was the first to shew that a metal never unites to an acid, except in the state of oxide:

that Richter first demonstrated, that when two *neutral* salts decompose each other, the results are always *neutral:* that the different weights of bases which unite to one acid, are in the same ratio as those which unite to other acids, to form other salts; and that in all salts of one genus, and in the same state of saturation, the quantity of oxygen in the oxide is proportionate to the quantity of the acid, and consequently to the quantity of oxygen in the acid.

Berthollet, says M. Thenard, proved that an acid might decompose a saline compound, without having as strong an attraction for the basis of the compound as has the acid with which it was first combined, and consequently that no reliance could be placed upon the usual tables of affinity; that double decomposition is affected by the insolubility of the resulting compounds; and that two saline solutions, which, in a certain state of dilution, are incapable of decomposing each other, acquire that power by concentration, because, in that case, one of the resulting salts can no longer remain dissolved.

Davy has proved that the alcaline and earthy bodies have metallic bases; and their compounds, with the acids, are, therefore, referable to the class of metallic salts.

Berzelius first carefully observed the decomposition of salts by the pile; that the quantity of oxygen in the acid of a salt bore a simple ratio to the quantity of oxygen in the oxide; he has also determined, with almost mathematical precision, the composition of the greater part of the salts. Dulong, Gay Lussac, and Wollaston, are likewise deservedly quoted, as benefactors to this department of chemistry.

The third volume of M. Thenard's work presents a good and useful digest of organic chemistry, vegetable and animal —and the arrangement here, less artificial, is more intelligible than that of the former parts. In the first chapter the elements of vegetable bodies are enumerated with extreme brevity. The second chapter treats, under two sections, of the formation of vegetable bodies; and in the third, their properties are examined. The vegetable acids, and their salts, occupy the first section, which, however, appears objectionable,

because bodies are here brought upon the stage, the sources of which are not as yet laid open. Thus, the production of vinegar might have preceded the account of the acetic acid and acetates, &c. In these acids, however, the relative proportion of oxygen to hydrogen is greater than in water. In the substances of the second section, the relative proportion of oxygen to hydrogen is the same as in water; these are—sugar, *mannite ? sweet principle of oils ?* asparagine, starch, gum, and wood The third section embraces the oils, resins, alcohol, and ethers, and some other bodies, marked by excess of hydrogen. The fourth section relates to colouring matters, and their uses; the fifth, to vegeto-animal bodies; and the sixth, to substances imperfectly examined; among which we were startled at meeting with extractive matter and tannin; the latter surely deserves to be acknowledged as a legitimate proximate principle of vegetables—its existence cannot be called "*douteuse.*"

The different parts of vegetables are chemically described in the fourth chapter—the pith, juices, woods, barks, roots, leaves, &c.; and the fifth relates to the products of fermentation—to coal, and bitumens. The animal bodies are subdivided into—1. Substances "ni acides, ni grasses." 2. Acids with double and triple radicles. 3. Fatty substances: 4. Saline and earthy bodies. Under the heads of digestion, circulation, and respiration, the chyle and blood are spoken of, and the other animal principles are enumerated as secretions.

Unpardonable brevity pervades this part of the work; indeed M. Thenard has throughout slurred over chemical physiology in a slovenly way. We turned with some eagerness to the "Theory of Animal Heat," (Vol. iii. p. 525), and are only told, that as the blood is always forming new products, and entering into new combinations, heat ought to be evolved: and that M. De Laroche has made experiments to prove, that the temperature of warm blooded animals is influenced by that of the surrounding air. Although we are by no means anxious for too much bare physiology in a chemical treatise, it is pretty obvious that a slight notice of

Mr. Brodie's curious investigations, concerning the influence of the brain on animal heat, would have been much more in place, than the bald assertions contained in a disputed thesis of M. De Laroche.

The fourth volume contains an essay on chemical analysis; it is short, but the subject is so important, as to merit longer notice than we can now afford. An examination, therefore, of this, which is indeed an independent treatise, may be deferred till we can give it more room in another Number of the Journal.

Though we have met with much that is clever and well managed in these volumes of M. Thenard's treatise, we must be allowed to grumble a little, at the faults of omission and commission, of which we have presented a few to our readers. It is a work certainly inferior to the system of Murray, and much below the elaborate production of Dr. Thomson, of which we hope soon to see a new edition, loudly demanded, from the recent progress of chemistry. We are glad too, of this opportunity, of expressing our unqualified approbation of Dr. Henry's "Elements," a book not less important for the copious and well arranged facts which it contains, than for the candour and clearness of the narrative.

Art. VI. *Of the Ergot or Clavus in Corn, known among Farmers by the name of the Spur. From an Essay on the genus Sclerotium, by Monsr. De* Candolle, *in the Mémoires du Muséum d'Histoire Naturelle, Paris.*

The above-mentioned essay is of considerable interest, as containing the probable discovery of the origin and nature of a disease in corn-plants, by which the produce of one of their most useful species is often, in many districts of Europe, rendered dangerous to the health of the inhabitants, of whose

food it forms the principal portion. To know the origin and nature of a disease, independent of the acquisition to knowledge, and gratification of curiosity, is important, as an advance towards the discovery of the remedy. The scientific denomination of that which forms the subject of this extract, is *Clavus,* the vernacular one in France, Ergot, with us, it is called the Spur in Rye and Barley. Its nature had been long a research among naturalists, but still remained the problem which Monsr. De Candolle has endeavoured to solve. He thinks he has proved it, like the different sorts of Smut and Blight, to arise from a Mushroom of the genus SCLEROTIUM, and ranks it by the specific name of *S. Clavus.* The proofs are drawn principally from analogy, the very low state of organization in the members of the genus to which he presumes it to belong, or perhaps our present imperfect acquaintance with them, seeming scarcely to admit of any other. Their organs of reproduction are still a question.

The *Sclerotiums,* of which 30 species have been enumerated, are small solid fungous bodies, generally of a rounded, oval, or elongated form, but not very constant to any; their interior substance is hard, sometimes a little fleshy, sometimes almost as hard as wood, always white or inclining to white, entirely free from the veins which give the marbled appearance we observe in the flesh of truffles; the outer skin is smooth in an early stage, often a little wrinkled in a more advanced one, usually black, sometimes of a dingy purple, seldom yellow or white, and covered in several species by a peculiar kind of dust or efflorescence, of the same colour as the surface.

Contrary to the opinion of Messrs. Tode and Persoon, *Sclerotium* is ranked, by M. De Candolle, between *Elvella* and *Clavaria,* as belonging to that groupe of Mushrooms which have external organs of reproduction, *(spori),* and not internal ones, as in the truffles, to which it had been before approximated. The differences from *Clavaria* are so slight, as not to be easily characterised, and consist principally in a form almost always simple, more ovoid, less elongated, and in not growing in any very precisely determinate direction; the hardness and solidity of the flesh is likewise of

much assistance in discriminating the *Sclerotiums* from the greater portion of *Clavarias.*

Sclerotiums, like the *Clavarias,* are found in a great diversity of situations. Some are subterraneous, and grow on the roots of mosses, or in the mass of tan in bark-beds; many are produced in close damp places, screened from the light, as under moss-heaps; some upon the surface of the ground, but under the droppings of cattle. One species comes very near to the nature of a parasitic plant; it grows in Germany on the cabbages which are stored under ground for the winter, and then always springs from the nerves of the vegetable: the greater portion of the species grow upon leaves and branches which are beginning to decay, and seem intended to hasten the dissolution of them. Some are peculiar to the fading foliage of trees; some grow on the rind of living fruits, or on the receptacle of compound flowers; some in the interior of fistular twigs; finally, there are those which grow on the living leaf, after the manner of true parasitic vegetables; that is, by growing from under the epidermis; and if the proposition in regard to *Clavus* is established, we have an instance of one of the genus, which takes its rise from within or near to the germen in Gramina, and is developed in the place of that organ. Among the known parasites, the *Sclerotiums* seem to be among those which affect the general health of the plant the least. All the species (with the exception perhaps of *S. cyparissiæ*), are developed after the plant to which they are attached has done flowering, and rarely affect the form or impede the ripening of the seed.

Mushrooms of a soft substance when young, whose seeds happen to have been developed in a position that does not admit of the complete or natural expansion of the plant, have the curious property of moulding themselves on the surface of the obstacle which presents itself.

The Clavus or Ergot is an elongated excrescence, which fills the place of the seed within the glume or husk of Rye, and several other species of Gramina. Like the generality of *Sclerotiums,* it is a parasitic production; it grows, as they do, upon the living plant, but only when that tends towards

decay; it has, like them, an appointed place of growth. Other species are found on leaves, stalks, receptacles, and fruits; it is therefore not extraordinary that one should be found to grow within the husk of the gramina. A greater diversity of station will be found upon a comparison of that of the various species of *Uredo* and *Puccinia*. If we examine a full grown individual of the Ergot species, we find most exactly the nature, the colour, the form, and even the casualties incident to most *Sclerotiums*; its flesh is firm, white, compact, of one substance; its surface dingy purple; its whole aspect, in one word, so like that of *S. compactum*, *stercorarium*, and some others, that the analogy could hardly be denied by any one who has had the opportunity of seeing them together. The form of the Ergot is cylindrical, varying in regard to length from 4 to 12 lines, in thickness from 2 to 4 lines, in direction from straight to more frequently curved, and in having or not having a longitudinal groove; variations which correspond with those in the true *Sclerotiums*. In regard to the groove or furrow, it is often wanting; when present, it depends without doubt upon the situation in which the Ergot has been developed, either in relation to the husk or glume, or else to the immediate covering of the germen out of which it is presumed to have originally issued.

But M. De Candolle justly observes, it is not sufficient to prove his proposition, to shew that the Ergot has the form and appearance of a *Sclerotium*; but that it is also incumbent upon him to make it appear, that all we know in relation to its mode of existence, is conformable to that opinion. With this view, he quotes from the work of Mons. Teissier, who had made this production an object of his peculiar attention, the following remarks, made, it is true, in 1783, a period when the history of Mushrooms was known with too little exactness to suggest the analogy now discovered as to its nature. These observations shew:—1. That all causes which tend to increase the degree of humidity, are universally favourable to the existence of Ergot; and we know that the same holds true in regard to all mushrooms, and peculiarly so in regard to the *Sclerotiums*. 2. That there are certain

districts more subject to this disease than others, although under circumstances equally favourable to its appearance; which proves that the Ergot does not owe its rise to these circumstances alone, but that its history falls within the scope of that of organized beings, whose existence is derived from a germ. 3. That the Ergot cannot be produced by watering the ears of corn, and for this reason, the seeds of that mushroom are not then introduced. 4. That the Ergot is strictly topical, one or more seeds in the same ear may be affected, the rest not; and this agrees with what we know of the smuts, and most other parasitical mushrooms. 5. That the Ergot at first soft and pulpy, acquires solidity and length gradually, and that its growth has little correspondence with that of the plant on which it is found: all facts that apply naturally to a mushroom. 6. That the Ergot is not peculiar to Rye; it may be met with on almost all gramina; so a great number of parasitic mushrooms, such as the Puccinia *umbelliferarum*, P. *caricina*, Uredo *rumicum*, U. *ranunculacearum*, U. *violarum*, U. *fabæ*, U. *rinathacearum*, U. *carbo*, U. *capræarum*, U. *rubigo-vera*, U. *hypericorum*, U. *receptaculorum*, U. *saxifragarum*, Œcidium *pini*, Œ. *asperifoliarum*, Œ. *cichoracearum*, Œ. *ranunculacearum*, &c. are to be met with indifferently upon almost all the species of the respective natural orders of which they bear the names. 7. That the taste and smell of the Ergot, and above all its acrid and poisonous properties, are well accounted for in regarding it as a mushroom: that the chemical tests to which it has been submitted, have afforded results that agree better with a mushroom than any other vegetable substance. 8. Lastly, that the opinion which imputed the origin of the Ergot to worms or insects, has been long since abandoned, seeing that the worms or insects which have been met with in it are of such rare occurrence, as to shew that they are purely accidental. Among the facts recorded in M. Teissier's work, concerning the Ergot, Mons. De Candolle finds but one which does not directly fall in with his proposition, and that is where M. Teissier remarks, that he has seen seeds one half of which were sound Rye, the other half Ergot or Spur. On this M. De Candolle observes, that the fact is exceedingly

rare; that M. Teissier is the only writer who has seen it, that he himself has been employed for several years past in the study of the Ergot, but has never met with one such instance; yet admitting the fact, with all the confidence to which the observations of M. Teissier are entitled, that it is still within the bounds of analogy, since we frequently meet with seeds of different corn-plants, half of which only consist of smut, a disease admitted to arise from a mushroom; then, as to the particular case of the Ergot, it may be supposed, that in developing itself either a little later, or from a somewhat unusual dislocation, it may, by possibility, have left to the corn-seed, the means of a partial developement, and of grafting itself to its base.

Upon the review of facts, of which the above is a cursory statement, M. De Candolle thinks he is justified in coming to the conclusion, that the Ergot is a species of mushroom of the genus *Sclerotium*, to which he gives the title of *Clavus*; that the *spori* or organs by which the plant is reproduced, are situated at the exterior, and not in the interior; and that the spawn or seed falls to the ground, mingles with the soil, is conducted into the interior of the corn-plant by the water which feeds it, and is forwarded along the vessels, by the circulating juices, to the spot destined for the developement of each germ.

Mons. De Candolle concludes his essay by an ample monograph of the genus Sclerotium, illustrated by a well-executed coloured engraving of nine of the species, together with the substances on which they are found. Among these is the figure of an ear of Rye, with specimens of the Ergot in their natural position.—*See Plate VIII, fig. 3, of the present Number.*

Mons. De Candolle displays considerable ingenuity; but we confess we do not find the industry and resources evinced by the President of our Royal Society, and his coadjutor, Mr. Ferdinand Bauer, in the well-known Treatise on the nature of the Blight in Wheat. In such hands, we suspect that even the slight mist of hypothesis which still dims the point, would have been dispelled.

Art. VII. *On the mechanical Structure of Iron developed by Solution, and on the Combinations of Silex in Cast Iron.* *By* J. F. Daniell, *Esq. F. R. S. and M. R. I.*

In prosecuting my inquiries into the resistance which mechanical structure offers to chemical action, I have been led to bestow considerable attention upon the difference of the molecular arrangement of various kinds of iron. No subject stands more in need of illustration, nor is there any, perhaps, which is more likely to lead to useful practical results, than one which concerns a substance of such primary importance to the arts.

I have failed to produce regular crystals in iron, by the means which I have successfully employed with the more brittle metals; but that, under certain circumstances, it does assume such forms, is fully demonstrated, by some observations of Dr. Wollaston, upon a mass of native iron, found in Brazil, and which have been published in the last volume of the Philosophical Transactions (1816.) From this Paper I shall make a short extract, for the double purpose of indicating the from of the crystals, and of confirming the general accuracy of my observations upon the resistance of crystalline arrangement to chemical action, by his authority. I am the more happy in being enabled to do this, as I have had but too much reason to suppose that my experiments had failed to produce conviction, where it was so much to be desired.

" The specimen of the iron with which Mr. Mornay very " liberally supplied me for experiment, though it necessarily " bears marks of the hammer by which it has been detached, " presents also other surfaces, not only indicating that its " texture is crystalline, but showing also the forms in which " it is disposed to break, to be those of the regular octohe- " dron and tetrahedron, or rhomboid, consisting of these " forms combined. In my own specimen, *the crystalline " surfaces appear to have been the result of a process of*

"*oxidation, which has penetrated the mass to a considerable*
"*depth in the direction of its laminæ*; but in the specimen
"which is in the possession of the Geological Society, the
"brilliant surfaces that have been occasioned by forcible
"separation from the original mass, exhibit also the same
"configurations as are usual in the fracture of octohedral
"crystals, and are found in many simple native metals."

This spontaneous decomposition of the metal in the direction of its crystalline laminæ, is a new and valuable fact in the chain of evidence; and I have myself since observed an analogous instance of similar disintegration. In crossing the Alps, in the course of last summer, I remarked that the veins of carbonate of lime, which run in the mica slate, had their surfaces, which were exposed to the action of the atmosphere, *weathered* into distinct and well defined rhomboids.

But to return to our subject. Although mathematical solids were not discovered by a solution of iron, yet a difference of structure was plainly discernible in the different varieties submitted to the experiment, which is well worthy of attention.

A cube of *gray cast iron*, of a granular fracture, was immersed in diluted muriatic acid. When the acid was saturated, it was taken out and examined. The size of the cube did not appear to be at all diminished, owing to a soft spungy substance, which had not been acted upon. This was easily cut off in large flakes, with a knife. Of this substance I shall have occasion to say more hereafter. The texture of the iron, of course, could not be learnt for this covering. But the metal having been submitted to repeated solution, the quantity of the residuary matter gradually decreased, and the surface being scrubbed with a brush, was found to be covered with small irregular ridges, which, when examined with a magnifier, presented the appearance of bundles of minute needles.

A mass of *bar iron*, which had undergone all the operations of *puddling* and *rolling*, was next submitted to the experiment. When the acid was saturated, it presented the appearance of a bundle of fasces, the fibres of which it was composed,

running in a parallel and unbroken course throughout its length. At its two ends, the points were perfectly detached from one another, and the rods were altogether so distinct, as to appear to the eye, to be but loosely compacted.

The next subject of examination was a specimen of *white cast iron*, of a radiated fracture. The first thing worthy of remark was, that it took just three times as long to saturate a given portion of acid as the two preceding specimens. Its texture, when examined, differed very much. It appeared to be composed of a congeries of plates, aggregated in various positions, sometimes producing stars upon the surface, from the intersection of their edges. It exhibited altogether a very crystalline appearance, but no regular facets were discoverable.

A small bar of *cold short iron* was next selected; it was exceedingly brittle, and its fracture presented bright and polished surfaces much resembling antimony. Its texture, however, when subjected to solution proved to be fibrous, but not so perfectly so as the first specimen of bar iron. The course of the fibres was very much broken, the acid having dissolved out small cavities which cut them short. It was a square bar, and the alternate sides were more acted upon than the others, so that the fibres would moreover appear to have been flattened.

A rod of *hot short iron* presented at the end of the operation, a closely compacted mass of very small fibres, perfectly continuous. The congeries was twisted, but the threads preserved their parallelism. A portion of a gun-barrel was submitted to the experiment. The metal was remarkably free from particles of an extraneous nature. The texture proved to be fibrous, but the threads were not regular or straight. They were generally disposed in waved lines, and the whole together was very compact.

A mass of steel just taken from the crucible in which it had been fused was subjected to the action of muriatic acid. It was of a radiated texture, the upper surface being marked with rays which proceeded from the centre to the circumference. It was readily acted upon by the solvent, and when

withdrawn, presented a highly crystalline arrangement. It appeared to be entirely composed of very bright and minute plates which reflected the light in every direction. The laminæ were very thin, and there was no order discoverable in their mutual positions.

A specimen of cast steel which had been subjected to the action of the tilting hammer of a very fine white granular fracture was next examined. It was not easily acted upon even by strong muriatic acid, and it required the addition of a small quantity of nitric acid to effect its decomposition. When the acid was saturated, the metal still presented a compact appearance; nothing of a fibrous structure was visible; but in one or two places where the acid had acted with most energy, it had detected the edges of laminæ, which appeared to form plates of the extent of the whole surface.

The blade of a razor composed of Wootz steel presented the same appearance, differing in nothing except three large notches in the back at right angles to the edge.

The blade of a razor of an inferior description presented a fibrous texture of waving lines. Deep notches in the back similarly placed were likewise visible in this. It was sufficiently evident, that the fibrous texture of this razor was owing to the admixture of iron and to the imperfection of the process for converting it into steel.

A bar of steel of an even granular fracture was broken into two. The two pieces were heated in a furnace to a cherry red. In this state one of them was plunged into cold water, and the other allowed very gradually to cool by the slow extinction of the fire. They were then both placed in muriatic acid, to which a few drops of nitric acid had been added. The last was readily attacked, but it required five fold as much time to effect the saturation of the acid of the first. When the solvents had ceased to act they were both examined. The tempered steel was exceedingly brittle, its surface was covered with small cavities like worm-eaten wood, but its texture was very compact and not at all striated. The untempered steel was easily bent and not elastic, and it presented a fibrous and wavy texture.

I am inclined to hope that these observations may not be without interest, and that if properly followed up, they may lead to some useful practical results. We find that the excellence of iron for mechanical purposes, depends upon its fibrous texture. The raw material, as we may term the crude cast iron, is better fitted for working in proportion as it approaches to this texture. We can trace a strong analogy between it and other fibrous substances. In flax, and hemp, the fibres are carefully separated from the other constituent parts of the vegetables by putrefaction and beating. In iron, the parts which are not fibrous are thrown off by a species of fermentation, called puddling and hammering. In the former, the fibres are interlaced with one another by tearing them into short pieces, and by a species of carding. In the latter, the same purpose is effected by cutting the bars into short pieces repeatedly, tying them in bundles, and again welding them together. The vegetable fibres are spun out into lengths, and are found to be tenacious and fitted for use. The fibres of the metal are likewise drawn out by rolling, and their acquired toughness, adapts them to the purposes of the arts.

Might not the same twisting of the threads, which is found to give compactness and strength to hemp and flax, be employed with advantage to increase the tenacity of the particles of iron? Is there not something analogous to this in the waved structure of the gun barrel, which is known to be particularly tough? And may not the superior quality of the Damascus sword blades, which is still a problem to our manufacturers, be owing to some such management? Their structure would answer exactly to the idea of small rods of iron and steel welded and twisted together, and afterwards beat out. The experiment is worth the trial.

The good qualities of steel seem to depend for different purposes upon a varying mechanical arrangement of its particles. This difference of structure is conferred by certain regulations of temperature. We find that the same bar of metal suddenly cooled from a high temperature is possessed of a quite different texture, and different mechanical properties from those which characterise it, when gradually lowered.

May not the qualities of cast iron vary also with the rate of cooling? and might not a proper regulation of heat improve the fibrous texture, or even confer a certain degree of malleability?

I proceed now to a very different species of investigation, into which I was naturally led, while prosecuting the preceding experiments. I have mentioned above, that in dissolving the cube of gray cast iron, a porous, spungy substance was left untouched by the acid. This was easily cut off with a knife. It was of a dark gray colour, somewhat resembling plumbago. Some of it was put to dry on blotting paper, and in the course of a minute, spontaneously heated and smoked. In one instance, when a considerable quantity had been heaped together, it ignited, and scorched the paper. Its properties were not impaired by being left for days and weeks in the solution of iron, or in water. I left some for three months covered with a solution of sulphate of iron, and exposed in an open dish to all the changes of the weather. At the expiration of that time, red oxide of iron had been deposited from the sulphate, but the black matter when collected upon blotting paper, raised the thermometer twenty degrees. Muriatic and sulphuric acid both extracted the substance. When nitric acid was used, the plumbaginous matter was produced, but no longer heated in the air. I immediately commenced a series of experiments for the purpose of ascertaining the nature of a body which presented such a curious anomaly.

A portion of it just prepared was placed in a shallow dish upon the water trough, and a bell glass of common air inverted over it. The water gradually rose, and the residue of the air being examined at the end of twenty-four hours, it was found that the oxygen had been totally absorbed.

Another portion was put into a retort to which a stop-cock had been adapted. The air was exhausted, and the moisture allowed to evaporate. Oxygen gas was then admitted. It became very hot, and the gas was absorbed. There was no change of appearance in either experiment. In chlorine it also became very hot, and a yellow liquid formed. This was

washed out. A black powder was left of a high metallic lustre resembling plumbago. The solution was precipitated with ammonia, and afforded nothing but black oxide of iron.

After the residue of the iron had absorbed its dose of oxygen, it was heated to redness, and digested in muriatic acid to take up all the oxide of iron with which it was necessarily mixed. When well washed and dried, it exactly resembled that which had been prepared with chlorine; 320 grains afforded 95.6 of the metallic powder.

The muriatic solution was precipitated by ammonia. The precipitate was boiled with a little nitric acid and heated to redness. It weighed 166.8.

Muriate of barytes was poured into the solution of muriate of ammonia, from which the oxide of iron had been collected, and a dense white precipitate of sulphate of barytes was formed, weighing, when washed and dried, 178.4.

From these preparatory experiments then, we learn, that the residue of the cast iron, after the action of sulphuric acid, heats, in consequence of its uniting with the oxygen of the air; and this residue, after it has so absorbed oxygen, is composed of

Oxide of iron - -	166.8
Sulphuric acid, - -	60.4
Gray substance, with metallic lustre,	95.6
	322.8

The increase of weight being probably owing to the higher oxigenation of some of the iron, by boiling in nitric acid.

The next object of inquiry, is the nature of the gray substance unacted upon by the acids.

Nitric acid, and nitro-muriatic acids, did not act upon it at a boiling heat.

When examined with a magnifier, it did not seem to be perfectly homogeneous in its composition, but presented the appearance of bright metallic particles, powdered and mixed with a grayish white dust. It deflagrated with nitre and oximuriate of potash at a very high heat.

Some of it was fused with pure soda in a silver crucible.

When it entered into igneous fusion, a gas was given off, which burnt with flame, and slight explosion. When cold, it was of a greenish colour. It was dissolved out with distilled water, and much of the powder was found to have been unacted upon. It was digested in muriatic acid, and had now assumed a brighter aspect, and was of a perfectly uniform texture, exactly resembling micaceous iron ore in small thin scales. The muriatic acid had taken up some oxide of iron.

The sodaic solution was saturated with muriatic acid. It effervesced strongly. It was evaporated, and when reduced to about one half, it gelatinized. When perfectly dry, the muriate of soda was dissolved, and nothing but pure silex remained.

Guided by these hints, and by many other preparatory experiments, which it would be tedious to enumerate, I obtained the following more determinate results.

35 grs. of the gray powder, which had been thoroughly separated from all oxide of iron, by digestion in muriatic acid, were exposed to a low red heat, in a silver crucible, with 200 grs. of pure soda. When a puff of gas took place, the crucible was instantly removed from the fire. The contents were dissolved out with distilled water. The solution was filtered, and the residue well washed and dried. It weighed 10.9 grs. It was digested in muriatic acid, again washed and dried. It then weighed 10.0. It now exactly resembled the micaceous iron.

The muriatic solution let fall a small quantity of red oxide of iron upon the addition of ammonia.

The sodaic solution was saturated with muriatic acid. It barely effervesced. It was evaporated to dryness, and towards the end of the operation, it gelatinized. It was diligently stirred till dry. The muriate of soda was dissolved, and the remaining white insoluble substance heated to redness. It then weighed 23.8 grs. and possessed all the properties of silex.

Here then we arrive at another step of our inquiry; and we find that the 95.6 grs. of the gray substance, is composed of

65.0 silex,

30.6 metallic substance, like micaceous iron.

for 35.0 : 23.8 : : 95.6 : 65.

The small quantity of oxide of iron obtained, and the slight effervescence of the soda, was owing, as we shall afterwards find, to the decomposition having been carried a little too far.

50 grs. of the micaceous substance, which had all been subjected to the action of red hot soda, were mixed with 500 grs. of pure soda, in a silver crucible. It was exposed for two hours to a heat just short of the melting of the silver. A large quantity of inflammable gas burned off. When this had ceased, the crucible was removed from the fire, and allowed to cool. It was digested in distilled water, and the solution passed through the filter. What remained was well washed and dried, and weighed 31.8.

This was digested in muriatic acid, and afterwards weighed 23.8.

The muriatic solution was precipitated with ammonia, and the red oxide of iron weighed exactly 8.0 grs. corresponding to the deficiency of weight. The remainder was found to be the micaceous substance, totally unaltered in its characters.

The sodaic solution was neutralized with muriatic acid, and gave off carbonic acid in abundance.

It was then evaporated to dryness, and, during the process, it gelatinized. It was digested in distilled water, and the remainder, which was perfectly white, heated to redness. It weighed 5.8.

Again, to collect the results as we proceed—50 grs. were employed, of which 23.8 were unacted upon. The 26.2 furnish us with,

8.0	oxide of iron.
5.8	silex.
12.4	loss.
26.2	

To ascertain the nature of this loss, which, from previous experiments, is probably carbon, the following experiments were undertaken.

10 grs. were accurately mixed and triturated in a mortar, with 400 grs. of oxymuriate of potash. This mixture was

put into an apparatus composed of part of a gun barrel, closed at one end, and furnished with a flexible metallic tube at the other, which dipped into the first of a series of Woulfe's bottles charged with lime water. A strong red heat was applied to the barrel, and the carbonic acid produced precipitated the lime in the bottles, the last of which remained perfectly clear and undisturbed. The precipitate was carefully collected and dried; it weighed 38 8 grs.

Now, 100 parts of carbonate of lime contain 44 carbonic acid, therefore 100.0 : 44.0 : : 38 8 : 17, and 100 carbonic acid contain 28 6 of carbon, and 100.0 : 28.6 : : 17.0 : 4.8.

But in the barrel, 0.8 grs. were found to have been unacted upon. Therefore, 9.2 of the carburet contains 4.8 of carbon.

If we now apply this to the preceding experiment, we shall find that there is an excess in the products,

For 9.2 : 4.8 : : 26.2 : 13.6,

which gives the result—

8.0	oxide of iron.
5.8	silex.
13.6	carbon.
27.4	
26.2	
1.2	excess.

Of this excess in the products, we shall consider the cause hereafter.

I shall proceed at present to relate another experiment which remarkably confirms the results of the others, though by a totally different method.

28.5 grs. of the carburet were mixed with 500 grs. of pure soda, and placed in an iron tube, similarly prepared to that in the last experiment. It was gradually heated to redness, and when gas began to be given off, the flexible pipe was adapted to it, and passed under the surface of lime water, in a Woulfe's bottle, communicating with the pneumatic trough. The heat was raised to a bright red, and continued for two hours. The gaseous products were collected in a bell glass,

having passed through the lime water without producing any milkiness. The gas collected amounted to 56 cubic inches.

When the gas had ceased to come over, the apparatus was allowed to cool, and the contents of the barrel washed out. The solution was passed through the filter, and the substance remaining upon it, washed and dried, weighed 13.5. It was digested in muriatic acid, again washed and dried, and weighed 6.5. It was the carburet unaltered. The loss of weight was owing to oxide of iron, as shewn by the examination of the muriatic solution.

The sodaic solution was put into a gas bottle, fitted with an acid holder, and communicating with a mercurial gasometer. Muriatic acid was allowed to mix gradually with it, and 39 cubic inches of carbonic acid were thus collected. The solution was then evaporated to dryness. The silex being washed and heated to redness, weighed 4.9.

The gas which had been collected was next examined.

It burned with a yellow flame. When sulphur was sublimed in it, carbon was deposited, and when exploded with chlorine, fuliginous matter lined the tube.

A cubic inch of the gas was mixed with two cubic inches of oxygen, in an exhausted tube, and fired, with an electrical spark, lime water was admitted and agitated. Carbonate of lime was formed, and the absorption was $\frac{25}{10}$. The residue consisted of oxygen, and varied in different experiments, from $\frac{5}{10}$ to $\frac{6}{10}$ of a cubic inch. When the oxygen was decreased in this proportion, the absorption was within $\frac{1}{10}$ of being total; and this small residue was probably owing to a little atmospheric air.

Now, as pure carburetted hydrogen condenses just double its bulk of oxygen, it follows that a little hydrogen was mixed with this gas, and an average of the experiments would make the mixture 50 cubic inches of carburetted hydrogen, and 6 inches of hydrogen.

Of 28.5 grs. of the carburet employed, 6.5 were recovered unaltered. 22 grs. were therefore decomposed. 39 cubic inches of carbonic acid weigh 18.3, and contain 5.0 of carbon,

and 50 cubic inches of carburetted hydrogen weigh 8.5, and contain 6.2 of carbon.*

The analysis therefore stands thus :—

7.0	oxide of iron.
4.9	silex.
11.2	carbon.
23.1	
1.1	excess.

Considering the complication of these experiments, and the difference in the method of operating, their agreement is nearer than could well have been expected.

The excess in the products is no doubt owing to the oxigenation of one or more of them in the process. The iron, as it is obtained in the results, is in the state of red oxide. If we suppose that it exists in the double carburet in the metalline state, there would be a deficiency instead of an excess. For 7.0 red oxide of iron, is only equal to 4.8 of the metal, and thus the result would be—

4.8	iron.
4.9	silex.
11.2	carbon,
20.9	
1.1	deficiency.
22.0	

I am inclined, from all circumstances, to believe, that the triple carburet, as it is first obtained, consists of iron and

* These calculations are made from Davy's Elements. The barometer, at the time ofthe experiment, was 29.74, and the thermometer 55°. I have not made the calculation for the mean pressure and temperature, the difference being so small.

silicum, in the metalline state, united to carbon. When brought into contact with oxygen gas, the metals become converted to protoxides, giving out heat, without separating from the carbon; and when decomposed at a red heat by soda, they become oxigenated to the utmost, at the expense of the water which is still found in the alkali at that temperature.

Red oxd. iron 7.0=6.2 black oxd.		
	4.9	silex.
	11.2	carbon.
	22.3	
	22.	
	.3	surplus,

arising from the oxigenation of the silex?

This idea is further confirmed by the following experiment. 3 grs. of the double carburet, perfectly pure, were placed in a glass tube, with one gr. of potassium. The air was exhausted, and the tube heated to redness. It was then allowed to become perfectly cool. When the air was admitted, the ingredients became instantly red hot. Upon washing the products, the carburet was obtained unaltered.

The following comparative experiments mark a distinctive difference between this body and some others, and confirm the general results.

Plumbago and potassium, heated in the same way in vacuo, did not heat upon the admission of the air.

Lamp black and potassium did not heat. Plumbago, in an ignited stream of mixed oxygen and hydrogen, burnt away, and left a red ash.

The double carburet, burnt in the same way, left a white ash.

Carbon collected from the solution of steel in an acid, possessed no metalic lustre, and ignited at the flame of a common candle, burning like tinder. The carburet was not affected by any heat short of that of the blow pipe.

I wish, in conclusion, to draw attention to certain analogies

which subsist between these experiments, and others performed by more able hands, for the purpose of establishing the existence and properties of silicum.

Sir H. Davy, in his Elements of Chemical Philosophy, says, "When potassium is brought in contact with silica, ignited "to whiteness, a compound is formed, consisting of silica "and potassa, and black particles, not unlike plumbago, are "found diffused through the compound

"From some experiments I made, I am inclined to believe "that these particles are conductors of electricity; they have "little action upon water, unless it contain an acid, when "they slowly dissolve with effervescence; they burn when "strongly heated, and become converted into a white sub-"stance, having the characters of silica."

When it is considered that most of the potassium, which is prepared for experiment, however well it may be cleaned, contains no inconsiderable portion of carbon, is it improbable that these particles, not unlike plumbago, may have been a carburet of silicum? Its little attraction for the oxygen of water, agrees very well with the phenomena which we have just been considering.

Professor Berzelius, and M. Fred. Stromeyer, have succeeded in producing a compound, which they consider as a combination of iron, silicum, and carbon. Their method was to select very pure iron, silex, and charcoal. These they made into a paste, with gum or linseed oil, and heated them very intensely, in a covered crucible. Their reasons for supposing that silicum, in the metallic state, existed in the product, were these, That the iron and silex extracted from the alloy, when taken together, very sensibly exceeded the weight of the alloy examined: that the alloy gave a much greater quantity of hydrogen, with muriatic acid, than the iron alone which it contained would have given; and that there is no known combination of a metal with an earth, which requires the successive operation of the most powerful agents to decompose it as this alloy did. The colour of this compound was that of common steel.

The quantities of the component parts, however, of this

alloy, differed very materially from those of the purified carburet obtained from cast iron. They varied from 85.3 of iron, 9.2 of silicum, and 5.3 of carbon, to 96.1 of iron, 2.2 of silicum, and 1.6 of carbon. They were likewise highly magnetic, (owing no doubt to the great quantity of iron), which the triple carburet is not.*

I have stated, that the quantity of the silex and triple carburet yielded by the iron which I employed, rather decreased in the interior of the mass. Towards the latter end of my experiments, I estimated the relative proportions. The iron was dissolved in muriatic acid, and the insoluble residue, after it had absorbed its dose of oxygen, was digested in muriatic acid. These solutions were precipitated by ammonia, evaporated to dryness, and exposed to a strong heat. The residue was boiled to dryness, with a little nitric acid, and again heated. The quantity of red oxide of iron thus obtained, amounted to 738 grs. which are equal to about 518 grs. of metallic iron.

The quantity of the gray mixture of silex and double carburet, amounted to 93 grs.

The mean results of all the experiments stand thus—

1000 grs. of the gray cast iron,

yield	846.6 iron.		
	153.4	consisting of silex	104.3
	1000.0	double carburet	49.1
			153.4

100 grs. of the double carburet of iron and silex, upon an average of five experiments, gave the following results—

Red oxide of iron	31.2	=	28.0 black oxide.
Silex .	22.3	=	20.6 oxide of silicum ?
Carbon .	51.4	=	51.4 carbon.
	104.9	=	100.0

* See Phil. Mag. No. 173, translated from the Swedish original; and Ann. Chim. tom. 81, from Gottingen Trans.

Although the existence of silicum in the metallic state, alloyed with iron, is not actually proved by the foregoing experiments, yet the probability of such a compound, I conceive, is greatly increased by them. Indeed, reasoning from analogy alone, it is hardly possible that ten per cent. of silex, could exist in union with the metals in any other manner. When we look to the result of intensely heating the oxides of the alkaline metals, in contact with iron, it would be surprising if the earthy oxides could resist decomposition, in the long continued and intense heat of the iron furnaces.

The process of puddling is almost evidently dependent upon the same supposition. The oxidation of the metals of the earths, is more likely to produce the heaving and internal motion of the iron in that process, than the mere burning away of carbon; and the sudden visible spontaneous increase of temperature, can hardly be explained upon any other principle. I have examined the slag or black oxide, which is pressed out from the iron by rolling, after it has undergone this operation. I extracted the greater part of the black oxide of iron which is combined with it, by muriatic acid; the matter which was left was a complete glass, composed of above 80 per cent. of silex with lime. There was no trace of carbon. Such a result is exactly consonant with this idea of the process.

Much remains still to be done, to complete our knowledge of the nature of cast iron. Notwithstanding the numerous experiments which have been made upon it, we remain in comparative ignorance of its composition. Guided by the new lights which the science of chemistry has lately acquired, an accurate revision of the subject could not fail to repay those who have an opportunity of tracing the changes of the metal in the various stages of its manufacture.

Art. VIII. *Historical Notice of* M. Péron (M. Deleuze, *Ann. du Mus. d'Hist. Nat.* T. 17, *Eloge Historique de* F. Péron, *Par.* M. Alard).

The sentiment occasioned by the death of a veteran of science partakes more of admiration than regret, and the panegyric we are eager to pronounce upon him, has ourselves and mankind in view, rather than him upon whom it is pronounced. But to eulogize the man who reaped no reward for his labours in his life, and had not time even to complete them; to bestow on him full and discriminating praise; to point out the importance of what was done, and what was to be expected; to pay a tribute of regret and affection to the memory of one whose claims upon our admiration were cut short by misfortune, is a duty imposed on us by humanity and generosity; and the performance of it is sure to be approved, as it appears to arise from a sense of gratitude, and to be purely disinterested. These sentiments are suggested by the premature death of the naturalist who is the subject of the present Memoir. His works, though sufficient to ensure him a distinguished rank amongst men of science, are far inferior to those for which he had made preparation; and the mass of information he collected will no doubt materially facilitate the means of understanding a part of natural history, which had been till his time much neglected. In tracing the outline of the life of Péron, it will be seen how much may be attained by one who, with a strong and active mind, without assistance or guide, entirely devoted himself to the pursuit of science.

Francis Péron, Correspondent of the Imperial Institute, Member of the Medical, Philomathic, and many other learned Societies, was born at *Cerilly*, in the department of the *Allier*, on the 22nd of August, 1775. He early shewed signs of genius, and almost from his infancy exhibited an ardent desire for the acquirement of knowledge. Being left on his father's death without provision, his family were desirous that he should learn some trade by which he would be enabled to maintain himself; his intreaties, however, prevailed with his mother,

and he was entered at the college at Cerilly. The Principal, pleased with the talents and the disposition of his scholar, bestowed particular attention on him; and when he had gone through a course of rhetoric, recommended him to study divinity; and the minister of the parish consented to take him into his house, and instruct him in philosophy and theology.

Up to this period Péron, who had been solely engaged by his studies, was utterly a stranger to the events which were passing in the world The Revolution had commenced: dazzled with the principles of liberty which led to it, he at once determined on a military career, quitted his tutor, for whom, however, to the last, he entertained a sentiment of gratitude, and enrolled himself in one of the national regiments. At the end of the year 1792 he was sent to the army of the Rhine, and from thence to Landau, which was then besieged. After the siege was raised, he rejoined the army opposed to the Prussians at Wessemburg, and which received a check at Kaiserlautern. In this affair Péron was wounded and made prisoner, and sent first to Wesel, and from thence to Magdeburg.

Even his captivity was of service to him. He had during the campaign devoted all his leisure time to study; all the money he could procure he now employed in the purchase of books. Several persons, interested by his manners and appearance; lent him many: the whole period of his captivity was devoted to general study. At the end of 1794 he was exchanged, and went to Thionville, where he procured his discharge as disabled, having lost an eye.. In August 1795 he returned to his native town, being then about twenty years of age. After devoting some months to the society of his mother and sisters, he became desirous of procuring some situation in which, by the exercise of his talents, he might be able to support himself. Having been successful in an application to the minister for an appointment of student in the medical school, he went to Paris, where, during three years, he applied himself very diligently not only to the study of medicine, but to those of zoology and comparative anatomy. He took his doctor's degree, and would perhaps have been amongst the most distinguished of the faculty, but

for an unfortunate event, which induced him to renounce his intentions of practising physic.

Péron, who had a lively imagination, and an ardent disposition, early formed a romantic attachment for a young woman in Paris. The hopes of future success in his profession, by which he should be enabled to support her whom he loved, served as an additional stimulus to excite him in his studies; but obstacles, which his eagerness and inexperience had induced him to disregard, destroyed all his hopes, and he was rejected by his mistress on account of his poverty. Overcome by despair, he eagerly sought to quit for ever scenes which reminded him of his disappointments. One violent passion is only to be opposed by another of equal force of a different nature. The army would have suited the disposition of Péron; and possessed of talents and intrepidity, he might have hoped to reach the highest rank; but the loss of an eye was an obstacle to his again entering into the service. The profession of medicine, and the pursuit of science, might still have had sufficient attraction for him; but how pursue his studies, surrounded by objects that perpetually reminded him of his misfortune? A rapid succession of events, by which he might be unceasingly occupied, was necessary to divert his mind from the recollection of the past, and he determined to travel. The French Government having ordered an expedition to be fitted out for the South Seas, two ships, *Le Géographe* and *Le Naturaliste*, commanded by Captain Baudin, were then lying at Havre, ready to sail, only waiting the last instructions from the minister. Péron applied to be employed: but the number of scientific persons intended to accompany the expedition being completed, he was at first unsuccessful in his request: he then addressed himself to M. de Jussieu, one of the persons charged with the selection of the naturalists, and begged him to interfere: "Let me but embark, and you shall see what I will perform," said he; and as a justification of his presumption, he proceeded to explain his plans and his views, with an earnestness and zeal which gave reason to conjecture he was capable of executing even more than he proposed.

M. de Jussieu, struck by his singular eagerness, advised him to draw up a memorial, stating his objects; and on reporting to his colleagues his interview with Péron, they determined in concert with the Count Lacépede, not to reject the services of a young person who possessed such extraordinary ardour, combined with so much knowledge. A few days afterwards he read to the Institute a paper on the utility of adding to the other scientific persons destined to accompany the expedition, a medical naturalist, specially charged to make enquiries into the history of man, and was unanimously elected one of the zoologists of the expedition. Péron was now about to seek in another hemisphere that fame which might recompense him for the loss of the domestic happiness to which he had in vain aspired. He spent the remaining few days in obtaining instructions from MM. de Lacépede and Cuvier, which might direct his studies. He attached himself principally to zoology, as the part of natural history which afforded the most extensive and most novel field. The two frigates sailed on the 19th of October, 1800: he was on board the Géographe. He united himself with all those whom, like himself, the love of science had determined to brave all dangers. He, however, contracted a particular intimacy with M. *Lesueur*. He lost not an instant: and even on the very first day of his going on board, commenced some meteorological observations, which he continued to repeat at intervals of six hours during the whole voyage; and during the early part of the voyage he made several very ingenious experiments on the temperature of the sea.

On approaching the equator they observed the ocean entirely covered with a phosphorescent light, which they found to proceed from innumerable animals whose colour resembled burning coals. Many of them were examined by Péron; and he observed, that while under examination they successively assumed the different prismatic colours until the irritability with which they were indued was exhausted.

The impresssion made on Péron by this phenomenon, and the singularities which he observed in the organization of this zoophyte, determined him to study more particularly the

animals of that class: and during the remainder of the voyage he and his friend Lesueur were occupied in observing the different specimens they were able to procure from the sea.

Lesueur painted, under the direction of Péron, these different animals as they were taken from the water and before their fleeting colours escaped, the two friends having agreed to unite their labours; the one designing, and the other describing the different objects they discovered. After a voyage of five months, they arrived at the Isle of France, where they were to take in the stores necessary for their course to Terra Australis. Many of the naturalists finding that the proper supplies were not furnished, and disgusted with the imperious and oppressive conduct of the Commander, determined to proceed no further. Péron, notwithstanding these obstacles, held himself bound by his engagements, and did not abandon the expedition. We shall not enter into any detail respecting the voyage, though we may remark on one or two of the most important objects.

On leaving the Isle of France they made for the westernmost point of New Holland, and anchored in a bay which they named *Bai du Géographe*, and after coasting along the west coast, went to Timor; and it was principally during Péron's residence at that place, so little known to naturalists, that he collected his information on the moluscæ and zoophytes: the sea being very shallow, the excessive heat of the sun caused these curious animals to multiply in great numbers on those coasts.

Péron's whole days were spent on the strand, wading amongst the reefs, endangering his health, and even his life. He did not return home till night-fall, loaded with the various animals he had procured, which he spent the night in examining, and the more remarkable of which were drawn by his friend. Notwithstanding the illness which had attacked some of the party, and the dangers to which he was exposed, his zeal was unabated; the eagerness with which he collected different objects of natural history, did not, however, prevent his making observations of a different nature: he

spent several days in the interior, for the purpose of studying the character and manners of the natives.

Struck by the fact, that the members of the expedition had been nearly all attacked by illness, whilst the inhabitants escaped the influence of the climate, he conceived, after careful observation, the difference to arise from th constant use of betel by the natives.

On quitting Timor, they proceeded to the south cape of *Van Dieman's* Land, and after reconnoitering the eastern side, they entered Bass's Straits, and coasted along the southern part of New Holland. We shall not trace the melancholy picture of their sufferings: it will be sufficient to remark, that on their arrival at Port Jackson, there were not more than four of the crew capable of duty; and that had they been kept at sea a few days more, they must have perished.

After the departure from Port Jackson, whence the *Naturaliste* was sent back to France, a navigation not less perilous than that which they had accomplished remained to be performed. The islands situated at the western entry of Bass's Straits were to be examined, and they were again to sail round the coasts of New Holland, and enter the Gulph of Carpentaria. Péron was indefatigable in his researches for every object of natural history, and in his observations on the natives.

Of five zoologists who had been appointed to the expedition, two had remained at the Isle of France, two had died before the beginning of the second year, and thus Péron alone remained: regardless of all privations, his mind was solely occupied with the objects of his appointment; and the commander having refused to allow the spirits necessary to preserve the objects of natural history, Péron hoarded up during the remainder of the voyage his personal allowance, and applied it to preserving his specimens. Péron having gone on shore with some of the naturalists at King's Island, the vessel was driven off the coast for fifteen days. He is said never once to have lost his calmness for a moment, quietly continuing his researches, as if regardless of what was to happen. During the time he was in that inhospitable island, he collected one

hundred and eighty species of meluscæ and zoophytes; he collected materials respecting the phocæ, which frequented the shores in large numbers; and he has given an interesting account of the mode of life of twelve wretched fishermen, Englishmen, who, cut off from the rest of mankind, spent their time in collecting oil, to be carried away, at distant intervals, by the English ships. These miserable beings chiefly subsisted on kangaroos, and one or two other animals, which they caught with dogs. They willingly shared their wretched fare with the travellers—receiving them with that simple hospitality which is perhaps oftener found amidst the rude and thinly scattered inhabitants of an ungrateful soil, than in civilized and polished society, where selfishness, and the clashing of interests, serve to deaden the natural feeling of pity. On their last stay at Timor, Péron completed his observations on that island.

He had frequent intercourse with the natives, whose manners and government he was now better able to observe, as he had acquired the Malay language.

The winds preventing their making the coast of New Guinea, and entering the Gulph of Carpentaria, they returned to the Isle of France, where they remained five months. Whilst there, Péron, after he had arranged his collection, devoted his time to the study of the moluscæ and fish on the coast; aud, notwithstanding the researches of the different naturalists who had preceded him, succeeded in discovering many new species. They staid at the Cape a month, during which time he made some observations on the Boshmen. At length, after an absence of three years and six months, he disembarked at L'Orient, the 7th April 1804, and repaired immediately to Paris.

He employed some months in arranging his collection of specimens, and making a catalogue, previously to their being deposited in the Museum. After this was accomplished, he went to Cerilly, to see his mother and sisters. His health, weakened by the fatigues he had undergone, and by the beginning of a disorder which soon after shewed itself more plainly, rendered rest and quiet absolutely necessary.

Secure, in the consciousness of having well performed his duty, he did not think it necessary to take any particular steps with Government, in explanation of what had been done during the voyage. He had not, however, been long in the enjoyment of domestic quiet, when, to his surprise, he learnt that some persons had attempted to persuade the administration, that the object of the expedition had failed. On this, he instantly returned to Paris, to refute these calumnies.

He waited on the minister for the naval department, and with modesty, but firmly, stated what his companions had done for the sciences, of geography, mineralogy, and botany; and gave in a list of the different objects which they had brought back—the drawings of Lesueur, and the observations and descriptions which he had collected. All the questions which were put to him, were answered with great perspicuity and naïveté; and such was the impression produced that the minister, convinced of the importance of what had been achieved, undertook to have the nautical part of the voyage compiled by M. Freycenet, (one of the principal persons employed during the voyage;) and to apply to M. De Champagny, the minister of the home department, in order that similar directions might be given with respect to the historical part.

The same success attended him with M. Champagny. He was received with the most flattering attention; and the publication of the narrative part of the voyage, and of the description of the new objects of natural history, was entrusted to him, in conjuction with his friend Lesueur. Thus, Péron was at once brought into notice; and he who till then had been nearly unknown, was, on a sudden, courted and eagerly sought after.

The collection deposited in the Museum, was examined, and a commission named by the Institute to make a report on it to the Government. The result of which was, that it contained more than 100,000 specimens of animals, amongst which were several new genera, and above 2500 new species; thus M. Péron and Lesueur had alone discovered more animals than all the modern travellers put together.

Although he was chiefly occupied in the preparation of the account of his voyage, he composed several memoirs, which were transmitted to the Institute, and several other learned Societies. Amongst the rest, were essays on the genus pyrosoma, the phosphorescent zoophite before mentioned, on the temperature of the sea, on the petrified zoophites found in the mountains of Timor, on the dysentery of warm climates, on the use of betel, on the health of mariners, and on the relative strengths of savages and civilized persons; and he also undertook a complete history of the medusæ, which he had particularly studied, and of which he had collected a considerable number of species, till then unknown. The first volume of this account of the voyage was published about nine years ago; and from this an estimate of the merit of Péron may be formed. We shall content ourselves with a few general remarks, on a work so recent, and so well known. The facts are stated with great clearness and precision—one of the most important qualifications of a work of this nature; there is much curious matter in the description of the soils and climates of the different countries. The account of the different races of people which inhabit the Straits of New Holland and Van Dieman's Land, has brought us intimately acquainted with two of the most ferocious tribes of savages, and exhibits the human species in the most degraded state in which it has as yet been discovered.

No former voyager, with the exception perhaps of Forster, has so well seized on the physical and moral characters of the different tribes of the South Sea islanders; and, if Forster's narrative is more entertaining, Péron has no where like him indulged in theoretical speculations; and his work is free from that air of fiction, which is the great defect of the work of Forster.

Péron was more attached to zoology than to botany; and it is to be regretted, that he did not attend more to the vegetable productions of the different countries he visited. His style is not sufficiently simple for a narrative. Yet though generally too florid, there are many passages of exquisite

beauty. We refer particularly to his description of Timor, and the inhabitants of Van Dieman's Land—passages not unworthy of the pen of Buffon.

There is no part of his work which is so deserving of attention, as that in which he considers the advantages of civilization; and he has with singular felicity, thrown new lights, and added fresh interest, by a combination of new facts and suggestions, on a subject which seemed to have been long exhausted.

Part of the second volume of his voyage was printed in his life, but he did not live to complete it. This is very lately published; and we shall, in a subsequent article of this Journal, notice its contents.

In addition to the different memoirs published by Péron, on zoology, he was occupied in collecting materials for a more considerable work, on the the different races of mankind; and had, with great industry, compiled information from all the preceding voyagers and physiologists on this subject; and besides this he had himself opportunities of examining the inhabitants of the Cape, the aborigines of Timor, the savages of New Holland and Van Dieman's Land, and had prepared a philosophic history of different races of mankind, with reference to their physical and moral qualities. This, however, he did not mean to publish till he had accomplished three voyages. One to the north of Europe, and part of Asia. Another to India; and the third to America: and he intended to devote fifteen years to the completion of this task. His whole plan was completely digested. He had collected all his questions, and was unceasingly occupied in solving the different problems which he had proposed.

Many of his memoirs on this interesting subject were from time to time condemned, as he discovered his errors or misconceptions; but the fragment containing the history of the people of Timor is nearly completed; the figures to accompany it were drawn on the spot, and the expense of engraving them, is the sole obstacle to its publication.

His portfolio contained a vast collection of descriptions of the birds, quadrupeds, and fish, which he had seen; and more especially of the animals without vertebræ, the history of

which he had undertaken, and of which his friend had made more than a thousand drawings.

These will probably be published by M. Lesueur, in conjunction with the professors of the Museum.

His character is thus drawn by M. Deleuze: Péron was eager, not only to improve his understanding by the acquisition of knowledge, but also to correct his faults, and to perfect his moral qualities. He had studied himself in this respect, and had committed to writing his observations on his own character. In these observations, which were not meant to meet any other eye than his own, he has been as unreserved in his praises as in the blame of himself; and we cannot better characterise him, than by the following extract from one of his notes, found amongst his papers. Its date is November 1800—written therefore at a time when he could not have supposed that he should attain a celebrity which would render its publication probable.

"Heedless, giddy, disputatious, self-willed and opiniated, unbending to the will of others, I foresee, I shall at once make a thousand enemies, and alienate the esteem of my best friends. These defects are somewhat attributable to my education, and solitary and independent habits of life. Though I am aware that they obscure the better parts of my character, yet such is the irresistible force of habit, that all attempts at correction have as yet been fruitless. Nevertheless, I feel I have no cause to blush at my faults, for be they what they may, I am guiltless of intentional wrong; and the sincere regret which has always followed the commission of error, has hitherto satisfied my own conscience. These defects of my head are, I think, compensated by some good qualities of my heart.—I believe myself to be feeling, kind, and generous.—I am not conscious of ever having willingly wronged a single creature; and though my friends may have suffered for my intemperate sallies, and may have had reason to complain of my indiscretions, still they have always been willing to admit the goodness of my heart, and acknowledge my attachment and kindness to them. These qualities have accompanied me through life; and at college, and with the army, it enabled me to conciliate the esteem of those with

whom I was brought in contact; and often induced me to succour those unfortunate victims, who, by the ambition of their sovereigns, became a prey to the fury of the French army. Alas! how frequent has the glory of our soldiers been tarnished by rapine and cruelty! How often has my heart bled at cruelties I could not prevent, but in which I never concurred. Young and enthusiastic, none can say that misfortune has not always found in me a zealous friend. A stranger to the tone and manners of society, with an impetuous and uncontrollable imagination, and a frankness always imprudent, and frequently bordering on ill-breeding; obstinate in the support of my own opinions, and heedless, I have often for a time alienated the esteem of my friends; but as soon as passion passes away, and reason regains its empire, I have blushed at my violence, and eagerly sought the pardon of those whom I had offended. The sincerity of my excuses and professions has always been successful, and I still possess the esteem of my friends, though there is not one but has had some cause of complaint."

The candour of this confession, cannot but interest the reader in the favour of Péron. All those who were in habits of intimacy with him, recognized the fidelity of the portrait, except that he was in error, where he attributes the attachment of his friends solely to the goodness of his disposition. This quality, instead of being accompanied, as in many, by inefficiency and weakness, was in him united to courage, and an activity and zeal, which rendered him often of the greatest service to others.

He not only acquired the esteem and the friendship of those with whom he lived, but contrived to gain an ascendancy over their minds, which was the more extraordinary, considering his ignorance of the world, and as he could have bestowed but little consideration on the means of governing others, or of gaining partizans.

Simple and unpretending in all common occurrences of life, in those of importance, Péron was another being: his mind became exalted, his discourse and gesture imposing, and he commanded his equals as though he conceived they had not power to resist his will. None, however, were more gay,

lively, or good tempered; nor more willing to overlook the defects of his acquaintance, when he found them united with good qualities.

Some periodical work having stated his merits to be superior to those of a very distinguished foreign traveller, he lost not a moment in desiring its contradiction: "I don't fear," said he, "to be thought vain enough to be privy to such an exag-"geration of my merits; but it is an injustice done to ano-"ther, even to let such a statement pass uncontradicted."

Many instances of his disinterestedness and liberality are related by his biographers. The pension which had been granted to him being scarcely sufficient to supply him with necessaries, the minister offered to appoint him to an office at once lucrative and honourable, but he refused, observing, "That he had devoted himself entirely to the cause of science; "and that if he took a place, it would become him to attend "to the discharge of its duties; and with his objects and "engagements, he could not consider his time at his own "disposal."

As soon as he was nominated to the charge of drawing up the history of the voyage he had been engaged in, he resided constantly in Paris, lodging, with his friend Lesueur, in a small apartment near the Museum.

He practised the most rigid economy, in order that he might be enabled to spare part of his scanty allowance to his sisters, who were living in poverty and obscurity. The disorder on his lungs began to make a fearful progress, and it was considerably increased by the shock he received from the death of his mother. He was afflicted by a cough, accompanied by incessant fever: all remedies that were applied were found ineffectual. He soon perceived that the disease was mortal; and considering all attempts to stop its progress as time lost, devoted himself unremittingly to the completion of some of the works which he had commenced.

M. Corvoisart having advised him to pass a winter at Nice, he conceived himself bound to yield, and was much benefited by the journey; and the mildness of the climate appeared in some degree to have restored his health. Whilst at Nice, he gave himself up to study with fresh vigour, passing whole

days in a boat out at sea, collecting moluscæ and fish ; and it was only that he might not afflict his friend Lesueur, who accompanied him, that he consented to return when exposed to danger of a recurrence of his disorder, from the wet and cold. The letters he wrote to his friends whilst at Nice shew how enthusiastically he was devoted to science.* Nevertheless, the transitory relief he enjoyed, did not deceive him as to the real state of his health, and he flattered himself merely with the hope that he had a few months respite; and these he well employed. The collection and observations he made at Nice are extremely valuable.

When he returned to Paris, his health soon became worse than when he quitted it. I saw him frequently, observes M. Deleuze, and sought to inspire him with hope; but he had none :—he spoke of his end with perfect calmness; and on a sick bed, he contemplated the approach of death with the same even courage with which he had so often braved it in the field; amidst the tempests of the sea; or amongst the savage inhabitants of inhospitable shores.

As his illness increased, he felt a desire to end his days where they had began, and in the arms of his sisters, who had been the objects of his earliest affections. He bade a solemn and a last farewell to all his friends, and set off for Cerilly, where he resigned himself to the advice and prescriptions of his friends, the inability of which, however, he was well aware of.

By the direction of his old friend and fellow-student, M. Bonnet, his bed was placed in a cow-house, and whenever he required any sustenance, either his sisters or Lesueur fed him

* In proof of this we give an extract from a letter written to M. Freycinet, who was employed in the geographical part of the voyage :

" Never, I protest to you, my dear F———, have I worked more than at the present moment; and so does Lesueur. The instant we rise we begin our labours, and break off to take our scanty meal with regret. But for the frightful torments which afflict me, I never was more happy or contented. Of this I assure you, on my honour—and this I call real existence; for I know no one pleasure so great as that which arises from useful and honourable occupation. Seeing your friend, thus near the grave, apply himself so unremittingly to science, will, I doubt not, animate you with the most generous courage to persevere in your own labours !—"

with new milk: he was surrounded by the beings whom he best loved. In order to prevent his exhausting himself by speaking, his friend Lesueur read to him constantly, except whilst he slept. He preserved to the last moment of his life that eager desire for knowledge which he had manifested from his earliest youth. As his end approached, all his impatience and irritability passed away; and the only subject that continued to interest him was, the welfare of his poor and unprotected sisters, whom he was about to quit for ever. His strength became quite exhausted, and during the night of the 14th of December, 1810, having received from his friend a small quantity of milk which he had asked of him, pressed his hand, and expired!

We have entirely abstained in the foregoing notice from entering into the question respecting the misrepresentation contained in the first volume of M. Péron's work, which was calculated to rob the ill-fated Captain Flinders of the merit of his discoveries. It seems to be generally admitted that M. Péron was controlled in this respect by an *over-ruling authority*; and Flinders himself has not scrupled to testify his belief that his candour was equal to his acknowledged abilities. Both these meritorious travellers now rest in an early grave, and were alike snatched away before they were in full possestsion of the applause and admiration to which they were so well entitled, on account of their devotion to the cause of science.

Though we are willing to acquit M. Péron of all share of the attempt to rob Flinders of the merit of his hard-earned labours, yet we should be sorry to omit an opportunity of testifying our detestation of the base and narrow policy which led to the detention of the unfortunate navigator at the Isle of France. Though this short-sighted manœuvre has been completely frustrated, and brought shame on its contrivers, its victim died heart broken, and worn out by disease, which had its origin in his cruel captivity. We shall again observe on this subject, in a short account of the life of Captain Flinders, which we propose to lay before our readers in the next Number of this Journal.

ART. IX. *On the Coniferous Plants of* Kæmpfer. *By* R. A. SALISBURY, *Esq. F. R. S. &c. In a Letter to the Editor.*

DEAR SIR,

I HAVE lately been examining all the plants I could meet with, belonging to the natural class of CONIFERÆ; and among others, those preserved in the British Museum, which were collected by KÆMPFER, in Japan, about 120 years ago. His descriptions excel many that are published in our days, under far more favourable circumstances; and as we have already a number of these plants in the gardens about *London*, and shall probably soon see more from *China*, I presume the following information respecting them, may just now be acceptable to several readers of your Journal. I shall take these plants as they stand in KÆMPFER's *Amœnitates Exoticæ*, giving his names first, and references to his Herbarium, MS. figures, and MS. descriptions, for the convenience of any one who wishes to consult them, adding some observations of my own, and a few which were communicated to me by the late learned botanist, Mr. DRYANDER.

1. *Na*, vulgo *Nági*, item *Tsíkkura Séba*. Laurus julifera, folio specioso enervi. *Kæmpf. Amœn. p.* 773, *cum. Ic. ad p.* (errore typographi) 874. *Herb. fol.* 41, *et* 63. *Figg. MSS. p.* 92, 93, *et* 119. Myrica Nagi, *Thunb. Fl. Jap. p.* 76. Nageia Japonica, *Pers. Syn.* 2. *p.* 614.

This is a charming fragrant evergreen, of slow growth, but in time as large as a *Cherry* tree; and so much esteemed in *Japan*, that it is brought from the woods, and planted in the gutters of their streets, as it is an aquatic. THUNBERG has referred it to *Myrica*; but I think there can be no doubt of its belonging to *Coniferæ*, though I have never seen its fructification, the specimens in KÆMPFER's Herbarium being without any. Mr. ROBERT BROWN, however, has been more fortunate, and given some information respecting it to that excellent carpologist RICHARD, whose work upon the subject will soon appear. PERSOON makes a distinct genus of it;

in my opinion, very properly; but he seems to have no idea of its affinity, still placing it after *Myrica*, notwithstanding Kæmpfer expressly says, that it has "nucleum individuum, apiculo, qui medium verticilli instar pervadit," which is one of the essential characters of *Coniferæ*. In a natural series, it comes very close to *Podocarpus*, but from Kæmpfer's MS. drawings of the fruit, I cannot join it to that genus, from which it likewise differs in habit

2. *Ken Sin*, item *Sen Baku*, vulgo *Inu máki*, i. e. *Máki spuria*. *Kæmpf. Amœn. p.* 780. *Herb. fol.* 24. Taxus Verticillata. *Thunb. Fl. Jap. p.* 276.

A very curious tree, growing conically, like a *Cypress*, but with totally different leaves, which are narrow, verticillated, and two or three inches long "No flowers or fruit on Kæmpfer's specimen; but from his short description, it cannot be a *Taxus*, and is most probably a *Podocarpus*."—Dryand.

3. *Sin*, vulgo *Máki*, seu *Fon Máki*, id est *Máki legitima*. *Kæmpf. Amœn. p.* 780. *Herb. fol.* 25. *n.* 1. *Figg. MSS. p.* 13. *Ic. Select. t.* 24. Taxus Macrophylla. *Thunb. Fl. Jap. p.* 276.

This is no doubt a congener of the preceding, and Kæmpfer himself says so; it becomes a large tree, and the wood is so light and durable, as to be in great request for cabinets. Neither of them have been yet brought to this country.

4. *Ginkgo*, vel *Gín an*, vulgo *Itsio*. Arbor nucifera folio Adiantino. *Kæmpf. Amœn. p.* 811 *cum Ic. Figg. MSS. p.* 91. Ginkgo. *Linn. Mant. p.* 303. Salisburia Adiantifolia. *Smith in Linn. Trans.* 3. *p.* 330.

This singular tree produces male flowers most abundantly in *Kew* garden every year, but no females; which, however, I am informed by Professor De Candolle, have been seen at *Geneva*: so that its immediate affinity in the class cannot be long unknown. I suspect that its fruit will prove reversed, or turned down, like that of *Nagia* and *Podocarpus*.

5. *Fi*, vulgo *Kaja*. Taxus Nucifera. *Kæmpf. Amœn. p.* 814. *cum Ic. Herb. foll.* 10, 21, *et* 22. *Figg. MSS. p.* 217.

A large tree very similar to our common *Yew* in habit; but perfectly sui generis. In a work I am now printing, I have

called it after HENRY LYTE, Esq. of *Lyte's Carey*, in *Somersetshire*, who translated DODOEN'S Herbal into our native tongue, and died in 1607. It was introduced here many years ago by GILBERT SLATER, Esq. who sent me a few female flowers, which it produced in his green-house; but I fear it is now lost, the plant which is sold by our nurserymen, and inserted in the Hortus Kewensis, for it, being very different.

6. *Sjo*, vulgo *Maatz*. *Kæmpf. Amœn. p.* 883.

"No specimen or description in his MSS. answering to this name, nor did I expect to find any, as he says it is only the *Japanese* generic name for different species of *Pinus*. THUNBERG, however, quotes it for *Pinus Sylvestris* L."—DRYAND.

7. *Sĕosi*, vulgo *Kara maatz Nomi*. Larix conifera, nucleis pyramidatis, foliis deciduis. *Kæmpf. Amœn. p.* 883. *Herb. fol.* 25. *Figg. MSS. p.* 218. *Descr. MS. p.* 137, ubi *Gojono Maatz* audit.

No flowers or fruit on the specimen, but as the leaves are 5-na in a sheath, it cannot be a genuine *Larix*. I have a suspicion that it is THUNBERG'S *Pinus Cembra*.

8. *Moro*, al. *Sonoro maatz*. Juniperus arborescens, baccis Sabinæ. *Kæmpf. Amœn. p.* 883. *Herb. fol.* 11. et in aliis foliis.

A species of tree *Juniper*, which I think is very distinct from *Communis* L. The ticket in p. 11, has upon it, in KÆMPFER'S own hand-writing, *Fi Moro*, aliis *Moro*, aliis *Sonoro Maatz*, aliis *Fusi Maatz*. In his description, he says, that it is a shrub about Meaco, but in other places becomes a tree.

9. *San* vulgo *Ssugi*. Cupresso-Pinolus resinifera, fructu sphærali squamoso, pruni magnitudinis; seminibus paucis oblongis, compressis, striatis, spadiceis. *Kæmpf. Amœn. p.* 883. *Herb. fol.* 7. *Descr. MS. p.* 138. *Figg. MSS. p.* 129. *Ic. Select. t.* 48.

Only a female branch of this has been drawn by KÆMPFER, and published by Sir JOSEPH BANKS, in the work last quoted.

There is a male branch, however, in his Herbarium, which, together with the perfect fruit in *Soho Square*, leaves no doubt that it constitutes a distinct genus, which I have called *Abela*, after the zealous naturalist now gone to *China* in the English embassy. It forms a large tree, and in GRONOVIUS's Herbarium is called *Speerboom*.

10. *Nankin Ssugi*. Juniperus Bermudiana. *H. Bat. Herm.* quæ ex Regni Sinæ provincia *Nankin* invecta, ob pulchritudinem colitur. *Kæmpf. Amœn. p.* 884. *Herb. fol.* 7. *n.* 2. *Figg. MSS. p.* 129, *n.* 3. *Descr. MS. p.* 89.

Another species of *Abela*, with glaucous leaves, which has long been cultivated in our green-houses, and I have no doubt will succeed in the open air. KÆMPFER departs a little from his usual accuracy in quoting HERMAN's plant, which came from America, and is the *Juniperus Bermudiana* L. for his. Besides this, we have a third species of *Abela* here, with green leaves, which is hardy, and cultivated by Mr. JOSEPH KNIGHT, at Little Chelsea; they all resemble the *Deciduous Cypress* in habit, and are likely to prove very ornamental.

11. *Ssugi bjakkusi*, aliis *Tatsi bjakkusi*. Arbuscula foliis musci terrestris acuminatis. *Kæmpf. Amœn. p.* 884. *Herb. fol.* 10. *n.* 3.

No figure or description. The specimen is a male branch of the *Juniperus* above mentioned under *Moro*.

12. *Faijo Ssugi*. Sabino similis arbor paucarum orgyiarum: cymis in gemmas squamosas strobulis simillimas desinentibus. *Kæmpf. Amœn. p.* 884. *Herb. fol.* 6. *n.* 1 *et* 4.

No figure or description. The specimens are male branches of *Sabina Chinensis*, now thriving in the open air at *Kew*, with all the leaves squamose.

13. *Jempak*, vulgo *Ibuki*. Juniperus arbor Cupressi facie, odore partium tetrico Sabinæ. *Kæmpf. Amœn. p.* 884. *Figg. MSS. p.* 129, *f.* 2. *Descr. MS. p.* 135.

There are neither flowers nor fruit upon the specimen, but it is very like the *Juniperus Daurica* of PALLAS, which rare shrub is at *Kew*, and in Mr. LAMBERT's collection at *Boyton*.

Both these plants may be distinguished by having their lower leaves squamose, and the upper leaves elongated and spreading; whereas, in all the others of the Order, which produce two sorts of leaves, the first and lower leaves, are the most perfect; and KÆMPFER has carefully noted this singularity.

14. *Quai*, vulgo *Fi no ki et Ibuki.* Cupressus succo imbuta pingui viscido aromatico, odorem Juniperinum spirante, fructu verrucoso parvulo, pisi magnitudinis. *Kæmf. Amœn. p.* 884. *Herb. fol.* 8. *n.* 1. Thuia Dolabrata. *Linn. Suppl. p.* 420.

A very imperfect fruit of this remarkable tree has merely enabled me to say it is no *Thuia;* but there are better specimens of the following plant, which, from its habit, is evidently a congener: in both the leaves are apparently 3-lobed, the branch lying concealed between the two leaves which form the middle lobe, and the deception is rendered more complete, by one half of the side leaves, and that whole middle leaf, which look towards the earth, being glaucous, and performing, no doubt, the office of an under surface. Accordingly, I have named this genus *Dolophyllum.*

15. *Fi noki* altera. Cupressus vulgaris nostras, foliorum odore balsamico; fructu ut plurimum quina semina, tritici grano similia, continente. *Kæmpf. Amœn. p.* 884. *Herb. fol.* 6. *n.* 3. *Figg. MSS. p.* 130, *n.* 2. *Descr. MS. p.* 135. *n.* 2.

A species of *Dolophyllum,* with smaller and much sharper leaves. By a note of KÆMPFER's, it appears, that *Fi no ki,* means a tree with leaves whitish or gray on the under surface; but *Konoto-Gasjiwa* a tree with leaves alike on both surfaces.

16. *Konoto-Gasjiwa. Kæmpf. Herb. fol.* 6. *n.* 2. *Figg. MSS. p.* 130. *Descr. MS. p.* 35. Thuia Orientalis. *Linn. Sp. Pl. ed.* 2. *p.* 1422.

"I cannot believe that the seeds and capsules of this shrub belong to the same genus with *Thuia Occidentalis,* however similar in habit."—DRYAND. There are other differences also in the fructification and male flowers, which prove Mr. DRYANDER's sagacity, and confirm the propriety of separating

them, but he thought this ought only to be done in a work on the whole Order, or rather Class; for I consider Coniferæ as a very extensive Natural Class, containing 6 Orders, viz. *Cycadēæ, Dacrydēæ, Cupressēæ, Laricinēæ, Eutassēæ, Ephedrēæ.*

17. *Asjinarū*, an arbor vitæ, aliter *Sowara no ki.* Kæmpf. Herb. foll. 7. et 19.

Both the specimens are now almost rotten, but when I examined them with Mr. Dryander at the time the *Icones Selectæ* were published, a few branches remained perfect, and corresponded minutely to that variety of *Thuia Orientalis*, now in our gardens, with rounder and smoother fruit.

R. A. SALISBURY.

18, *Queen-street, Edgeware-road,*
20th Sept. 1816.

Art. X. *Some Account of the meteoric Stones, in the Imperial Museum at Vienna. Communicated by Dr.* Noehden.

The mineralogical collection of the Imperial Museum at Vienna, is among the richest and most splendid in Europe. It contains objects of uncommon value, and beauty, and is altogether highly deserving the attention of the curious traveller. I visited it in June, 1815; my leisure, however, did not permit me so particularly to examine it, as to give any minute account of its general arrangement, or of the rare and valuable natural curiosities which are to be found in it—nor had I an opportunity of comparing it in these respects with the various British and Foreign collections which I had before visited. One of the first objects, however, that presented itself to my observation, was a glass case containing a superb series of meteoric stones; of these I shall give a short account in this Paper. I was struck with their number and variety, and with the uncommon size of one or two of them. One, which was found at Elbogen, in Bohemia, weighed two hundred weight. I had always considered that found by Mr. Topham in York-

shire, and now in the possession of Mr. Sowerby, as very large: at least, I had seen none that exceeded it in magnitude. But as it weighs little more than fifty pounds, it equals only the *fourth* part of that of Elbogen; and nearly all have some historical notices attached to them, as well as some account of the phænomena which attended their descent from the atmosphere; a circumstance too frequently neglected in collections of this kind, and which renders the present assemblage highly interesting and instructive. The specimens, which are nineteen in number, are as follows:

No. 1. A large stone from Agram in Croatia, which fell May 26, 1751, at 6 o'clock p. m. It is not smooth, or even, on the outside, but has depressions and protuberances.

No. 2. The large specimen from Elbogen, in Bohemia, before mentioned. There is no date to this. It weighed originally two hundred weight: but a piece has been cut off at one of the corners, perhaps the fifth part of the whole, for the purpose of manufacturing the iron it contained. Of the latter, several instruments were made, as curiosities, such as a garden-knife, pen-knife, a pair of scissars, and a magnetic needle. One or two of these articles are in the possession of the Emperor of Austria. What the quality of the meteoric iron, for such purposes, exactly is, I cannot pretend to say; but Mr. Sowerby caused, about three years ago, an elegant sword to be manufactured of that material, which was intended as a present for the Emperor of Russia. The inside of the Elbogen stone has a sort of waved, or damasked appearance, which perhaps arises from a peculiar crystalline texture of the iron.

No. 3. Specimen from Krasnojarsk in Siberia.

No. 4. Specimen from Neuhof, between Leipzig, and Grimma, in Saxony.

No. 5. Specimen from Collina and Brianza, in Italy, near Milan.

No. 6. Specimen from Tucuman, near St. Jago del Estero, in Peru.

No. 7. Specimen from Barbotam, in Gascony, (Departement des Landes, in France). Fell July 24, 1790, at 9 o'clock, p. m.

No. 8. Specimen from Toluca, near Durango, in Mexico.

No. 9. Specimen from Weston, in Connecticut, North America. Fell December 14, 1807, at 6 o'clock, a. m.

No. 10. Specimen from Tabor, in Bohemia. Fell July 3, 1753, at 8 o'clock, p. m.

No. 11. Specimen from Aigle in Normandy. Fell April 26, 1803, at 1 o'clock, p. m.

No. 12. Specimen from Lissa, in Bohemia. Fell September 3, 1808, at ½ past 3 o'clock, p. m.

No. 13. Specimen from Ensisheim, in Alsace. Fell November 7, 1492, at noon.

No. 14. Specimen from Eichstedt, in Franconia. Fell February 19, 1785, the hour not known.

No. 15. Specimen from Mauerkirchen, in Bavaria. Fell November 20, 1768, at 4 o'clock, p. m.

No. 16. Specimen from Casignano, near Parma and Placenza, in Italy. Fell April 19, 1808, at 1 o'clock, p. m.

No. 17. Specimen from Benares, in the East Indies. Fell December 19, 1798, at 8 o'clock, p m.

No. 18. Specimen from Smolensk, in Russia. Fell March 13, 1807, in the afternoon.

No. 19. Specimen from Stannern, near Iglau, in Moravia. Fell May 22, 1808, at 6 o'clock, a. m.

Of several of the foregoing specimens, there are duplicates in the collection; for example, a great many of No. 19; so that the Museum may, by exchanging, if an opportunity offer, increase the number of specimens.

Most of the above specimens have been analysed, and Mr. Mühlfeld, the keeper of the Mineralogical collection, offered, with great politeness, to communicate what information he possessed, upon that subject. My departure from Vienna prevented my availing myself in person of this offer, but I requested a friend of mine to apply for that communication. Mr. Mühlfeld, accordingly permitted him to copy the Papers on which the analyses alluded to, were recorded. This transcript I here subjoin, having translated it from the German into English.

Analysis of the meteoric Stones at Vienna.

No. 1. Analysed by Klaproth.

Native iron	96,50
Native nickel	3,50

No. 2. By Klaproth, and Neumann.

Native iron	97,5
Nickel	2,5

In repeating the analysis upon another piece, Klaproth found nickel 5,03; and Neumann, in another, nickel 5,32.

No. 3. By Klaproth.

(*a.*) *Substance resembling olivin.*

Silica	41
Magnesia	38,5
Oxide of iron	18,5

Howard, in 1802, gives this analysis.

Silica	27
Magnesia	$13\frac{1}{2}$
Oxide of iron	$8\frac{1}{2}$
Oxide of nickel . . .	$\frac{1}{2}$

(*b.*) *Olivin.*

Silica	27
Magnesia	25
Oxide of iron	23

(*c.*) *Iron.*

Containing 17 per cent. of nickel.

No. 5. Klaproth.

Not a vestige of nickel.

No. 6. Person who analysed it, not mentioned.

Iron	62 grains
Nickel	$7\frac{1}{2}$ ditto.

No. 7. Analyst not mentioned.

Silica	46
Magnesia	15
Lime	2
Oxide of iron	38
Oxide of nickel	2

No. 8. By Klaproth.

Iron	96,75
Nickle	3,25

No. 9. By Professor Cilleman, of Connecticut.

Silica	51,5
Magnetic oxide of iron .	38
Magnesia	13
Oxide of nickel	1,5
Sulphur	1,

No. 10. By Howard, Vauquelin, Mayer.

(*a.*) *Mineral substance.*

Silica . .	25	Howard. Vauquelin.	Silica . .	45,45	Mayer.
Magnesia .	$9\frac{1}{2}$		Magnesia .	17,27	
Oxide of iron	$23\frac{1}{2}$		Oxide of iron	42,72	
Oxide of nickel	$1\frac{1}{2}$		Oxide of nickel	2,72	

(*b.*) *Native iron.*

Iron	$12\frac{1}{2}$
Nickel	$1\frac{1}{2}$

No. 11. Fourcroy, Vauquelin, Thenard.

Silica . . .	53	Fourcroy Vauquelin	Silica . .	46	Thenard
Magnesia . .	2		Magnesia .	10	
Lime . . .	1		Lime . .		
Oxide of iron	36		Oxide of iron	45	
Oxide of nickel	3		Oxide of nickel	2	
Sulphur . .	2		Sulphur . .	5	

No. 12. Analyst not mentioned.

Silica	73
Alumine	1,25
Magnesia	22
Lime	0,50
Iron	29
Nickel	0,50
Manganese	0,25
Sulphur and loss . . .	3,50
	100

No. 13. By Bartholdy, Fourcroy, Vauquelin.

Sulphur . .	2	Bartholdy 1800.	Silica . .	56	Fourcroy Vauquelin
Iron . . .	20		Magnesia .	12	
Magnesia .	14		Lime . .	1,4	
Alumine . .	17		Oxide of iron	30	
Lime . . .	2		Oxide of nickel	2,4	
Silica . . .	42		Sulphur . .	3,5	

No. 14. By Klaproth.

Native iron	19,
Nickel	1,50
Oxide of manganese . .	16,50
Magnesia	21,50
Silica	37,

No. 15. By Imhof.

Silica	25,4
Magnesia	28,75
Metallic iron	2,23
Metallic nickel	1,2
Oxide of Manganese . .	40,24
Sulphur	2,08

No. 16. By Guidotti, Professor of Natural History, and Chemistry, at Parma.

Silica	50,
Oxide of iron	28,
Magnesia	19,
Oxide of nickel . .	2,59
Oxide of manganese .	1,50
Oxide of chrome, and sulphur	4,

No. 17. Name of the analyst not mentioned.

(*a.*) *Principal substance.*

Silica	48
Magnesia	18
Oxide of iron	34
Oxide of nickel . . .	$2\frac{1}{2}$

(*b.*) *Metallic substance.*

Iron	17
Nickel	6

(*c.*) *Globules.*

Silica	50
Magnesia	15
Oxide of iron	34
Oxide of nickel	$2\frac{1}{2}$

(*d.*) *External crust.*

Iron and nickel almost in a metallic state.

(*e*.) *Sulphuret of iron.*

Sulphur	2
Iron	$10\frac{1}{2}$
Nickel	1
Loss	$\frac{1}{2}$

No. 18. Analyst not mentioned.

Metallic iron	17,60
Metallic nickel	0,40
Silica	38,
Magnesia	14,25
Alumine	1,
Lime	0,75
Oxide of iron	25,
Sulphuret of Manganese	3,

No. 19. By Moser, Chemist and Apothecary, at Vienna.

Silica	46,25
Lime	12,12
Alumine	7,62
Magnesia	2,50
Black oxide of iron	27,
Oxide of Manganese	0,75
Chrome	a vestige.

It deserves to be mentioned, that Professor Stromeyer of Gottingen, well known as one of the ablest chemists, and most accurate observers, in Germany, is at present engaged in an analysis of meteoric stones: and the result of his experiments and investigations will, undoubtedly, prove interesting.

Art. XI. *An Account of some Experiments on the* Ergot *of Rye, found in the* Bois de Boulogne, *near Paris.—By Mons.* Vauquelin, *Member of the Royal Institute of France. In a Letter from Dr.* Granville *to the Editor.*

My Dear Sir,

The account you have given in the last Number of your Journal of the use of clavus, or the *ergot* of rye, in medicine, taken from an American Journal, may perhaps induce some of the

members of the medical profession to try the action of that substance on the human system, in order to verify the statement of Dr. Bigelow of Boston. Should they prove correct, the materia medica will have made a most important acquisition. To assist them, therefore, and to guide them in their researches on this interesting subject, I have requested Monsieur Vauquelin's permission to transmit to you, for insertion in your next Number, a detailed account of some analytical experiments made on a very recent occasion by that eminent chemist, on the *ergot* in question. The experiments I allude to were undertaken in consequence of a report ordered by the Academy of Sciences, on a note of Mons. Virey, wherein he asserted, that the *ergot* was not, as De Candolle asserts, a champignon—a *sclerotium;* but a morbid modification of the grain of the rye itself. The report has since been read before the Institute by Mons. Desfontaines; and the conclusions, as you will learn from the proceedings of that illustrious body during the last quarter, have been, to the astonishment of many, not only contradictory to the assertions of the author of that note, but also in opposition to Vauquelin's results. Of course it is not my business to inquire into the reasons of these discordant inferences: the writer of the Report himself gave none which could obviate the force of the arguments brought against him—may we not then continue to consider, as heretofore, notwithstanding Mons. De Candolle's opinion, the *ergot* as a disease of the rye, produced by a certain cause, and not as a parasitic plant?

Of Vauquelin's experiments, some he has had the goodness to permit me to witness; which has given me a new opportunity of appreciating the general accuracy, and the extensive knowledge, of that excellent chemist, whose good qualities are particularly enhanced by a high degree of modesty and liberality.

You will forgive me this small tribute of friendship.

M. Vauquelin intends shortly to publish his analysis in the "Annales du Musée d'Histoire Naturelle."

Physical Properties of the Ergot.

Colour. Externally, violet—internally, white.

Form. Cylindrical, gently tapering at the two extremities, curved in the form of a crescent—with a longitudinal-streak on the convex as well as the concave side.*

Dimensions. Six or eight lines in length—from two to three in its greatest diameter.

Flavour. At first imperceptible; but after some time, acrid and disagreeable.

Observations. A grain of the ergot cut transversely, and seen through the microscope, presented an assemblage of small and brilliant grains like starch. The external and coloured pellicle, seen under similar circumstances, appeared as a mass of a violet colour, strewed with small whitish spots.

The colouring matter of the ergot may be obtained by means of boiling alcohol, acting upon the dry and pulverized substance. The alcohol after a short time becomes of a dark red, a little inclined to violet. Heated with boiling water, and under the same circumstances, the ergot yields a beautiful violet-red colour—not so intense, however, as that obtained with alcohol. A very diluted solution of carbonate of potash, employed in the same manner, assumed a deep wine-red colour, which became more intense on application of heat. The acetic acid extracted no colour any way remarkable—the sulphuric acid was coloured red, but slightly—so was the muriatic acid, but more intensely—the tartaric acid, on the contrary, assumed a pale rose colour—and finally, the nitric acid destroyed the natural colour of the substance, by turning it yellow.

Water and alcohol, therefore, seem to be the real solvents of the colouring matter; especially the former.

Chemical Properties of, and Experiments with, the Aqueous Solution of Ergot, &c.

It reddens litmus paper, precipitates the acetate of lead of a lilac colour—lime water of a light blue, while the liquid

* See Fig. 3, Plate VIII.

remains of a rose colour—and acetate of iron of a blueish grey. When a little alcohol is added to the solution, and vinegar is used as a re-agent, the liquid remains of a rose colour, while the precipitate is of a purple red.

Experiments.

1st. Two ounces of the ergot, dried and pulverized, were treated with boiling water till the latter ceased to become coloured. This aqueous decoction was troubled by the tincture of galls, and the solution of chlorine in water. Evaporated and reduced to a consistent form, it gave an extract of a brown-red colour, having a taste, at first sweetish, but afterwards bitter and nauseous; it reddened litmus paper strongly; yet when triturated with caustic potash in an agate mortar, it emitted a strong smell of ammonia.

2d. The ergot, which had been treated with boiling water as above, was next submitted to the action of boiling alcohol, which assumed a slight yellowish red colour during the operation; and the soluble matter was obtained by a subsequent distillation. This matter was of a greenish brown, had an acrid and a bitter taste—it reddened litmus paper, and became puffy when projected on red hot coals, emitting a strong smell like that of burned bread.

3d. After having thus tried the action of these two solvents on the original quantity of the *ergot*, the residue was divided into several smaller portions, one of which slightly coloured, a diluted solution of sub-carbonate of soda; while another, distilled in a small glass retort, gave for produce an oil, sensibly alcaline, and colouring the water with which it was agitated; of an acrid and bitter taste, emitting an ammoniacal smell when triturated with caustic potash; and leaving behind some carbonaceous matter yielding, after combustion, gray ashes chiefly composed of phosphate of lime and magnesia, together with a small quantity of iron.

4th. Twenty grammes (310 grains), treated with cold water, and afterwards distilled at a slow fire, gave a liquid sensibly alcaline, restoring the blue colour to litmus paper

previously reddened by an acid, turning the syrup of violets green, and forming a white precipitate with solutions of acetate of lead and nitrate of mercury.

5th. Another experiment was made on a fresh quantity of the ergot, to ascertain whether it contained any amylaceous matter (starch). The result was a coloured substance without any of the properties of starch; while the water employed in the operation, after having stood some days in a closed phial, emitted a strong smell of ammonia, mixed with that of putrified fish; the latter to a very intense degree.

6th. To obtain the resinous matter in its pure state, forty grammes of the ergot were treated with alcohol, which, when evaporated to the consistency of extract, gave a brownish red substance, having a rancid fishy taste. The distilled alcohol had a most insupportable smell of putrified fish. The extract, when placed on red hot coals, burned with a strong smell of tallow.

7th. From a distillation of 40 grammes of the ergot, without any addition, a thick oil was obtained, of a most nauseous smell, and sensibly alcaline. Some of this oil, put in contact and agitated with water, gave the latter the appearance and the feel of a concentrated solution of soap The carbonaceous matter left in the retort weighed 7.700 grammes. The ergot had therefore lost in this distillation 32.300 grammes.

8th. Muriatic acid left in contact with the ergot for twenty-four hours assumed a deep purple colour.

Mons. Vauquelin extended his researches much further, and endeavoured to ascertain the real nature of the colouring principle in the ergot, which he applied to wool and silk; but for these I shall refer your readers to the Memoir Mons. Vauquelin intends publishing on this subject. I shall merely relate the conclusions derived from the above series of experiments.

It appears that the ergot contains·

1st. A pale yellow colouring matter, soluble in alcohol, tasting like fish oil.

2dly. An oily matter.

3dly. A violet colouring matter, insoluble in alcohol, and easily applicable to wool and silk.

4thly. An acid, probably phosphoric.

5thly. A vegeto-animal matter, very abundant, and prone to putrefaction, yielding much thick oil, and ammonia, by distillation.

It would be easy, from the above experiments, to prove that the ergot is merely a degeneration of the grain of the rye, produced by external causes. The physical characters of the ergot, and the principles obtained by chemical means, serve to shew the nature of the disease. The amylaceous matter has been succeeded by a gelatinous substance, and the gluten has suffered certain modifications. Hence the opinion of Vauquelin, that the ergot is not a parasitic plant, is not only plausible, but more than probable. Yet to prove in a more evident manner the great difference existing between the ergot and the species of mushrooms to which De Candolle has assimilated it, some experiments on the latter were instituted by the same chemist, the result of which I am also happy to be able to send you.

It appears then, that when a given quantity of *sclerotium* is treated with boiling water, the latter is not in the least coloured, has a milky appearance, an insipid taste, and is precipitated by alcohol, by solution of chlorine, or the infusion of galls, under the form of white flocculi.

That the extract obtained by evaporation is of a yellowish brown, of a sweetish taste, and in appearance mucilaginous like that of mushrooms in general.

That the infusion is not acid—and the oil obtained by distillation is neither so abundant nor so dense as that of the ergot.

That the latter contains a fixed oil, ready formed; whereas the *sclerotium* contains no such principle—an observation which may be applied also to the free ammonia contained in the former.

There exists, therefore, a very material difference between the two productions in question.

That you may judge yourself of the physical characters of the ergot, I have sent you some specimens of it—and likewise some of the wool and silk dyed with one of its two colouring principles.

I nearly forgot to mention that when a grain of the ergot is inflamed by contact with a lighted candle, it burns with a white flame, distilling some drops of an oily liquid, emitting a dense black smoke, and smelling like burnt bread.

Your's truly,
A. B. GRANVILLE.

Paris, 1st December.

*** Having had opportunity of repeating and verifying many of the above results, we have thought it right to insert them in the present Number, as well as the conclusions of M. De Candolle. They are correct and curious, as far as relates to the chemical properties of the *spur*: but whether they demonstrate *that it is not a sclerotium*, is another question. The editor begs to refer to the Proceedings of the Royal Institute of France upon this subject.

Art. XII. *Transactions of the Batavian Society of Arts and Sciences. Vol.* VII.—(Batavia, 1814.)

In our former Number, we noticed these Transactions, and furnished some extracts from the Discourse of Mr. Raffles, the President, to the Society.

It having been the policy of the Dutch, whilst in possession of Batavia, to conceal every thing relating to the country, the information which has, since its cession to England, been acquired, is particularly interesting.

As these Transactions are little known in Europe, and the Society is remarkable, by being the earliest literary society formed in the East, we shall give a short account of it up to the year 1811.

Previous to the establishment of the Batavian Society,

Mr. Radermacher, a gentleman of distinguished talents, in conjunction with a few friends at Batavia, conceived the idea of assembling together a number of persons of consideration and ability, with the view of encouraging the arts and sciences in the capital, and the other Indian establishments then dependent on Holland. They considered that in the East, as in Europe, where for two centuries the reformation in letters preceded that in religion, a taste for the arts and sciences must be introduced previously to the general adoption of the Christian religion; but they were aware of the difficulties to be encountered under the circumstances in which the colonies of Holland were then placed, and a considerable period elapsed before the design was carried into effect.

At length, in the year 1777, when Mr. Radermacher, and his father-in-law, the Governor General De Klerk, were newly elected directors of the Society of Haerlem, a programma appeared, which contained the plan of extending the branches of that Society to the Indies. The distance and extent of the Dutch colonial possessions did not, however, admit of this plan being realized, but the idea being thus brought forward to public notice, a separate Society was established at Batavia, by the unremitting perseverance of Mr. Radermacher, who may be called the founder of the institution.

On the 24th of April 1778, this Society was duly established, under the authority of Government. On its first organization, it consisted of 192 members, the governor general being chief, and the members of the high regency directors. The ordinary members were elected from among the most distinguished inhabitants of Batavia, and the other possessions of the company.

The Society selected as objects of research and enquiry, whatever could be useful to agriculture, commerce, and the welfare of the colony; it encouraged every question relating to natural history, antiquities, and the manners and usages of the native inhabitants, but expressly avoided entering upon

any subject which might relate to the East India Company; and in order the better to define the objects, and contribute to their accomplishment, a programma was from time to time printed and circulated.

In 1779 the Society undertook to print the first volume of its Transactions; the second appeared in 1780, and the third in 1781; but from the want of types, and other unfortunate circumstances, a programma only appeared in 1782. In 1786, the 4th volume was however given to the public, but printed in Holland, by the commissaries of the Society, under the special privilege of the States general.

After this period, the Society observing that the questions proposed remained unanswered, set to work themselves, and published the 5th volume in 1790. In this and the 6th volume, which appeared in 1792, the essays are written exclusively by the members.

In 1794 the two first essays intended for the 7th volume were printed; but no subsequent publication of the transactions of the Society appears to have taken place.

Subsequently, when the revolutions in Europe, the war and other circumstances of the times, continued to interfere with the prosperity of the Society, a more limited plan for its proceedings was adopted.

Such was the state of the Society at the change of Government in 1811, when the dark perspective was illumined, and the talents and ambition of the Society again shone forth from the obscurity in which political circumstances had involved it.

We must refer our readers generally to the discourse of Mr. Raffles, which contains a very interesting view of the present state of knowledge respecting Java, and the countries in its vicinity.

With respect to the six first volumes, Mr. Raffles observes—they contain much useful and interesting information, particularly on economical subjects, materially connected with the interests of science and literature.

In the first volume will be found an interesting description of the Dutch possessions in the East Indies, and the transac-

tions are replete with various valuable tracts on agriculture, commerce, political economy, and natural history, by Messrs. Radermacher, Van Hogendorp, Hooyman, Van Iperen, Baron Van Wurmb, Couperus, Van der Steege, Titsing, Tessiere, Van Boeckholtz, and others; and with regard to the contents of the present volume,* the papers by Dr. Horsefield are highly interesting to science. On the antiquities and natural history of the island, some light is thrown by Lieutenant Colonel Mackenzie, surveyor general on the Madras establishment, in his tract on the ruins of Prambana, forming the capital of one of the early dynastics of the Island of Java; and on the Island of Borneo, some interesting data are furnished from the pen of the late Dr. Leyden, on which to found further inquiries in that immense island.

Mr. Raffles, in the introductory discourse, observes—the first point which it appears essential to notice with regard to the future proceedings of the society, is the necessity of encouraging and attaining a more general knowledge of the

* CONTENTS.

I. Prize answer to the prize question of the society, on "the most proper food for young children, who are not suckled by their mothers or nurses." By Cornelis Terne, M. D. of Leyden.

II. Report on the manners and customs of the inhabitants of the Mountain Brama, with a history of their origin, according to an account from a letter from Mr. Adrian van Ryck.

III. Chemical analysis of a volcanic sand and iron ore. By T. Horsfield, M. D.

IV. Letter on the Solo river. By the same. Letter describing a tour to the eastern districts of Java. By the same.

V. Description of the Crinum asiaticum. By T. Horsfield, M. D.

VI. Description of the Gatip tree. By the same.

VII. Chemical analysis of the fruit of the Rarak tree. By the same.

VIII. On the Oopas, or poison tree of Java. By the same.

IX. Narrative of a journey to examine the remains of an ancient city and temples at Brambana, in Java. By Lieutenant Colonel Mackenzie.

X. Sketch of Borneo. By the late Dr. Leyden.

Javanese language. Hitherto the communication with inhabitants of the country, has been chiefly through illiterate interpreters, or when direct, though the medium of a barbarous dialect of Malays, confounded and confused by the introduction of Portuguese and Dutch.

Vocabularies have already been collected of the different dialects of the Javanese, and also of the principal languages in the eastern seas; and from the unremitting and indefatigable exertions of Colonel Mackenzie, whose researches into the history and antiquities of Western India, so eminently qualify him for similar pursuits in this quarter, we are justified in the expectation, that many of the doubtful points regarding the early connection of Java and the eastern islands with the continent of India, will be cleared up.

It is to what has been emphatically termed the "Further East," that I would direct your more immediate attention; and here, if I am not mistaken, an ample field is afforded. The History of Sumatra, by Mr. Marsden, has thrown so clear a light on the country and character of the inhabitants, that I have but to refer you to that valuable work for all that is yet known respecting that interesting island. Much, however, still remains to be done, even in this quarter, and our recent connection with Palembang, and the southern provinces of the island, promises to afford every facility to our inquiries.

Of the chain of islands lying east of Java, and with it denominated generally the Sunda Islands, I shall only notice particularly that of Bali. This island lies so close to Java, that it is surprising so little is known of it. All accounts agree, that vestiges of the Hindu or B'hudist religion, perhaps of both, are still to be found. Some accounts go so far as to state, that in the interior of the country, the inhabitants are divided into four tribes, termed Bramana, Sudra, Wazier, and Sutra; and it is certain, that on the final establishment of the Mahomedan religion in Java, the Hindus or B'hudists who remained unconverted, took refuge in that island.

We have hitherto only adverted to the countries lying in the more immediate vicinity of Java, but in extending the

prospect and directing our views eastward to the other islands of the Archipelago, our attention is forcibly attracted by the great Island of Borneo, hitherto a blank on the chart of the world. .From the best information we have yet been able to obtain of this immense island, greater in extent than any civilized nation of Europe, and abundantly rich in the most valuable natural productions, it would appear, that the whole country was, at no very remote period, divided under the three empires of Borneo, Sucadana, and Banjer Masin, of which the reigning princes of the two latter, trace their descent from Mah'japahit in Java.

Borneo or B'rni, now termed by us Borneo Proper, having been the first port visited by Europeans, may have given rise to the name of Borneo being erroneously applied to the whole island, which, by the native inhabitants, and universally by the eastern states, is termed Pulu K'lemantan.

It is impossible but to regret that circumstances have deprived this gentleman of the means he possessed, as governor of Java, of prosecuting the enquiries which he began, respecting these interesting and nearly unknown countries, and which he seems to have entered upon with a zeal and earnestness in the cause of science highly creditable to himself.

The singular imposition on the scientific world, respecting the Oopas tree, published in Holland in 1783, makes the account of Dr. Horsefield, given in this volume, particularly interesting.

The history and origin of this celebrated forgery still remain a mystery. Foersch, who put his name to the publication, was a surgeon in the Dutch East India Company's service. Having hastily picked up some vague information concerning the oopas, he carried it to Europe, where his notes were arranged, doubtless by a different hand, in such a form, as by their plausibility and appearance of truth, to be generally credited. It is in no small degree surprising that so palpable a falsehood should have been asserted with so much boldness, and have remained so long without refutation—or that a subject

of a nature so curious and so easily investigated, relating to its principal colony, should not have been enquired into, and corrected by the naturalists of the mother country.

To a person in any degree acquainted with the geography of the island, with the manners of the Princes of Java, and their relation to the Dutch Government at that period, or with its internal history during the last 50 years, the first glance at the account of Foersch must have evinced its falsity and misrepresentation.

But though the account just mentioned, in so far as relates to the situation of the poison tree, to its effects on the surrounding country, and to the application said to have been made of the oopas on criminals in different parts of the island, as well as the description of the poisonous substance itself, and its mode of collection, has been demonstrated to be an extravagant forgery,—the existence of a tree on Java, from whose sap a poison is prepared, equal in fatality, when thrown into the circulation, to the strongest animal poisons hitherto known, is a fact, which is fully established by the author of the present paper.

The tree which produces this poison is called antshar, and grows in the eastern extremity of the island.

The work of Rumphius contains a long account of the oopas, under the denomination of arbor toxicaria: the tree does not grow on Amboina, and his description was made from the information he obtained from Macassar.

His figure was drawn from a branch of that which was called the male tree, sent to him from the same place, and established the identity of the poison tree of Macassar and the other eastern islands with the antshar of Java.

The account of this author is too extensive to be abridged in this place; it concentrates all that has till lately been published on this subject. It is highly interesting, as it gives an account of the effects of the poisoned darts, formerly employed in the wars of the eastern islands, on the human system, and of the remedies by which their effect was counteracted and cured.

The simple sap of the arbor toxicaria, (according to Rum-

phius,) is harmless, and requires the addition of ginger and several substances analogous to it, to render it active and mortal. In so far it agrees with the antshar, which, in its simple state, is supposed to be inert; and before being used as a poison, is subjected to a preparation, which will be described after the history of the tree. The same effervescence and boiling which occurs on the mixture of the substances added to the milky juice by the Javanese in Blambangan, has been observed in the preparation of the poison of Macassar, and in proportion to the violence of these effects the poison is supposed to be active.

Besides the true poison tree, the oopas of the eastern islands, and the antshar of the Javanese, Java produces a shrub, which, as far as observations have hitherto been made, is peculiar to the same, and by a different mode of preparation, furnishes a poison far exceeding the oopas in violence. Its name is tshettik.

The antshar is one of the largest trees in the forest of Java. The stem is cylindrical, perpendicular, and rises completely naked to the height of sixty, seventy, or eighty feet. It is covered with a whitish bark, slightly bursting in longitudinal furrows: near the ground this bark is, in old trees, more than half an inch thick, and, upon being wounded, yields plentifully the milky juice from which the celebrated poison is prepared. A puncture or incision being made in the tree, the juice or sap appears oozing out, of a yellowish colour; from old trees, paler: and nearly white from young ones: when exposed to the air, its surface becomes brown. The consistence very much resembles milk, only it is thicker, and viscid. This sap is contained in the true bark (or cortex,) which, when punctured, yields a considerable quantity, so that, in a short time, a cup full may be collected from a large tree.

Previous to the season of flowering, about the beginning of June, the tree sheds its leaves, which re-appear when the male flowers have completed the office of fecundation. It delights in a fertile and not very elevated soil, and is only found in the largest forests. Dr. H. first met with it (the antshar) in the province of Poegar, on his way to Banjoowangee. In

clearing the new grounds in the environs of Banjoowangee for cultivation, itis with much difficulty the inhabitants can be made to approach the tree, as they dread the cutaneous eruption which it is known to produce when newly cut down. But, except when the tree is largely wounded, or when it is felled, by which a large portion of the juice is disengaged, the effluvia of which mixing with the atmosphere, affect the persons exposed to it, with the symptoms just mentioned, the tree may be approached and ascended like the other common trees in the forests.

The antshar, Dr. H. observes, like the trees in its neighbourhood, is on all sides surrounded by shrubs and plants: in no instance have I observed the ground naked or barren in its immediate circumference.

The largest tree I met with in Blambangan was so closely environed by the common trees and shrubs of the forest in which it grew, that it was with difficulty I could approach it. And at the time I visited the tree, and collected the juice, I was forcibly struck with the egregious misrepresentation of Foersch. Several young trees spontaneously sprung from seeds that had fallen from the parent, reminding me of a line in Darwin's Botanic Garden,

"Chained at his root two scion Demons dwell."

While in re-calling his beautiful description of the oopas, my vicinity to the tree gave me reason to rejoice that it is founded on fiction.

The tshittik is a large winding shrub. In large individuals has a diameter of two or three inches, covered with a reddish brown bark, containing a juice of the same colour, of a peculiar pungent, and somewhat nauseous odour.

From this bark the poison is prepared.

It is very rarely met with, even in the wildernesses of Blambangan.

The process of preparing the antshar was performed for me by an old Javanese, who was celebrated for hissuperior skill in preparing the poison. About eight ounces of the juice of the antshar, which had been collected the preceding evening, in the usual manner, and preserved in the joint of a bamboo,

was carefully strained into a bowl. The sap of the following substances, which had been finely grated and bruised, was carefully expressed and poured into it, viz.—Arum, Nampoo, (Javanese), Kaemferia, Galanga, Kontshur, Amomum, Bengley, (a variety of zerumbed), common onion and garlic, of each about half a dram; the same quantity of finely powdered black pepper was then added, and the mixture stirred.

The preparer now took an entire fruit of the capsicum fruticosum or Guinea pepper, and having opened it, he carefully separated a single seed, and placed it on the fluid in the middle of the bowl

The seed immediately began to reel round rapidly, now forming a regular circle, then darting towards the margin of the cup, with a perceptible commotion on the surface of the liquor, which continued about one minute. Being completely at rest, the same quantity of pepper was again added, and another seed of the capsicum laid on as before: a similar commotion took place in the fluid, but in a less degree, and the seed was carried round with diminished rapidity. The addition of the same quantity of pepper was repeated a third time, when a seed of the capsicum being carefully placed in the centre of the fluid, remained quiet, forming a regular circle about itself, in the fluid, resembling the halo of the moon. This is considered as a sign that the preparation of the poison is complete.

The tshettik is prepared by separating the bark of the root, and boiling it, and after separating the bark from the water, exposing the extract to the fire till it is about the consistence of syrop. After this, the preparation is the same as of the antshar.

An account of 26 experiments, is detailed by Dr. Horsefield, on which he remarks, that he has selected from a large number of experiments, those only which are particularly demonstrative of the effects of the antshar and of the tshettik, when introduced into the circulation. The poison was always applied by a pointed dart or arrow, made of bamboo.

The operation of the two different poisons on the animal system is essentially different.

The first 17 experiments were made with the antshar; the rapidity of its effect depends, in a great degree, on the size of the vessels wounded, and on the quantity of poison carried into the circulation.

In the first experiment, it induced death in 26 minutes,—in the second, in 13 minutes. The poison from different parts of the island has been found nearly equal in activity.

The common train of symptoms is, a trembling and shivering of the extremities, restlessness, discharges from the bowels, drooping and faintness, slight spasms and convulsions, hasty breathing, an increased flow of saliva, spasmodic contractions of the pectoral and abdominal muscles, retching, vomiting, excremental vomiting, frothy vomiting, great agony, laborious breathing, violent and repeated convulsions, death.

The effects are nearly the same on quadrupeds, in whatever part of the body the wound is made. It sometimes acts with so much force, that not all the symptoms enumerated are observed.

The oopas appears to affect different quadrupeds with nearly equal force, proportionate, in some degree, to their size and disposition. To dogs it proved mortal, in most experiments, within an hour. A mouse died in ten minutes; a monkey in seven minutes; a cat in fifteen minutes.

A buffalo, one of the largest quadrupeds of the island, died in two hours and ten minutes, though the quantity of poison introduced in this experiment was proportioned to that which was thrown into the system in the experiments on smaller animals.

If the simple or unprepared sap is mixed with the extract of tobacco or stramonium, (instead of the spices mentioned in the account of the preparation,) it is rendered equally, perhaps more active.

Even the pure juice, unmixed and unprepared, appears to act with a force equal to that which has undergone the preparative process, according to the manner of the Javanese at Blambagan.*

* We certainly were surprised at the Doctor's statement of the process of preparation which, in fact, seems to add nothing to the violence of the poison.

Birds are very differently affected by this poison. Fowls have a peculiar capacity to resist its effects. A fowl died 24 hours after the wound; others have recovered after being partially affected.

In regard the experiments made with the poison prepared from tshettik, its operation is far more violent and rapid than that of the antshar, and it affects the animal system in a different manner; while the antshar operates chiefly on the stomach, and alimentary canal, the respiration and circulation, the tshettik is determined to the brain and nervous system.*

A relative comparison of the appearances on dissection, demonstrates, in a striking manner, the peculiar operation of each.

After the previous symptoms of faintness, drowsiness, and slight convulsions, it acts by a sudden impulse, which, like a violent apoplexy, prostrates at once the whole nervous system.

In the two experiments, this sudden effect took place on the sixth minute after the wound; and in another, on the seventh minute, the animals suddenly started, fell down head foremost, and continued in convulsions till death ensued.

This poison affects fowls in a much more violent manner than that of the antshar, death having frequently occurred within the space of a minute after the puncture with a poisoned dart.

The simple unmixed decoction of the bark of the root of the tshettik, is nearly as active as the poison prepared according to the process above related.

The resinous portion of the bark is by no means so active as the particles soluble in water.

* Mr. Brodie, in a paper on vegetable poisons, (Phil. Trans. 1811,) has given an account of some experiments made by him, with the *upas antiar*, from Java, furnished by Mr. Marsden, from which it appears, that when inserted in a wound, it produces death, (as infusion of tobacco does, when injected into the intestines,) by rendering the heart insensible to the stimulus of the blood, and stopping the circulation.

Taken into the stomach of quadrupeds, the tshettik likewise acts as a most violent poison, but it requires about twice the period to produce the same effect which a wound produces; but the stomachs of fowls resist its operation.

The poison of the antshar does by no means act so violently on quadrupeds as that of the tshettik. Dr. H. observes he gave it to a dog; it produced at first nearly the same symptoms as a puncture; oppression of the head, twitchings, faintness, laborious respiration, violent contraction of the pectoral and abdominal muscles, an increased flow of saliva, vomiting, great restlessness and agony, &c. which continued nearly two hours; but after the complete evacuation of the stomach by vomiting, the animal gradually recovered.

Rumphius asserts, that a small quantity may be taken internally as a medicine.

In animals killed by the antshar, the large vessels in the thorax, the aörta and venæ cavæ, were, in every instance, found in an excessive degree of distension: the viscera in the vicinity of the source of circulation, especially the lungs, were uniformly filled in a preternatural degree with blood, which in this viscus, and in the aörta, still retained a florid colour, and was completely oxygenated. On puncturing these vessels, it bounded out with the elasticity and spring of life. The vessels of the liver, of the stomach, and intestines, and of the viscera of the abdomen in general, were also more than naturally distended, but not in the same degree as those of the breast. In the cavity of the abdomen, a small quantity of serum was sometimes effused.

The stomach was always distended with air, and in those instances in which the action of the poison was gradual, and in which vomiting supervened in the course of the symptoms, its internal coat was covered with froth.

The brain indicated less of the action of the poison, than the viscera of the thorax and abdomen. In some instances it was perfectly natural—in others, marks of a small degree of inflammation were discovered.

An undulatory motion of the skin, and of the divided muscles, was very evident in some of the dissected animals.

The appearances observed in the animals destroyed by the tshettik were very different. In a number of dissections, the viscera of the thorax and abdomen were found nearly in a natural state, and the large vessels of the thorax exhibited that condition in which they are usually found after death from other poisons.

But the brain and the dura mater shewed marks of a most violent and excessive affection. In some instances the inflammation and redness of the dura mater was so strong, that on first inspection, Dr. H. supposed it to be the consequence of a blow previously received, until he found, by repeated examinations, that this is a universal appearance after death from tshettik.

Rumphius had an opportunity of personally observing the effect of the poisoned darts or arrows on the human system, as they were used by the natives of Macassar, in their attack on Amboina, about the year 1650.

Speaking of their operation, he says, the poison touching the warm blood, is instantly carried through the whole body, so that it may be felt in all the veins, and causes an excessive burning, and violent turning in the head, which is followed by fainting and death.

After having proved mortal to many of the Dutch soldiers in Amboina and Macassar, they are said to have finally discovered an almost infallible remedy in the root of the Crinum asiaticum, (called by Rumphius, radix toxicaria), which, if timely applied, counteracted, by its violent emetic effect, the force of the oopas.

An intelligent Javanese informed Dr. Horsefield, that an inhabitant was wounded in a clandestine manner, by an arrow thrown from a blow pipe, in the fore arm, near the articulation of the elbow. In about fifteen minutes he became drowsy, after which he was seized with vomiting, became delirious, and in less than half an hour he died.

Dr. Leyden's Sketch of Borneo.

This paper contains much curious and new matter, and we regret that our limits will not admit of our giving any detailed account of its contents. The notices respecting the Dayak, which is the most numerous class of inhabitants, and probably the aborigines, are very curious. Their manners are characterized by some strange peculiarities and uncommon features of barbarism; but the spirit of these traits has never been elucidated, nor the system of religious or superstitious opinion with which they are connected, examined.

In appearance, the Dayak are fairer and handsomer than the Malays; they are of a more slender make, with higher foreheads and noses; their hair is long, straight, and coarse, generally cut short round their heads. The females are fair and handsome. Many of the Dayak have a rough scaly scurf on their skin, like the Jakong of the Malay peninsula. This they consider as an ornament, and are said to acquire it by rubbing the juice of some plant on their skin. The female slaves of this race which are found among the Malays have no appearance of it.

With regard to their funeral ceremonies, the corpse is placed in a coffin, and remains in the house till the son, the father, or the nearest of blood can procure or purchase a slave, who is beheaded at the time that the corpse is burnt, in order that he may become the slave of the deceased in the next world. The ashes of the deceased are then placed in an earthen urn, on which various figures are exhibited, and the head of the slave is dried, and prepared in a peculiar manner with camphor and drugs, and deposited near it. It is said that this practice often induces them to purchase a slave guilty of some capital crime, at five-fold his value, in order that they may be able to put him to death on such occasions.

With respect to marriage, the most brutal part of their customs is, that nobody can be permitted to marry till he can present a human head of some other tribe to his proposed bride, in which case she is not permitted to refuse him. It is not, however, necessary that this should be obtained entirely by

his own personal prowess. When a person is determined to go a head hunting, as it is very often a very dangerous service, he consults with his friends and acquaintances, who frequently accompany him, or send their slaves along with him. The head hunter then proceeds with his party in the most cautious manner to the vicinity of the villages of another tribe, and lies in ambush till they surprise some heedless unsuspecting wretch, who is instantly decapitated. Sometimes too, they surprise a solitary fisherman in a river, or on the shore, who undergoes the same fate. When the hunter returns, the whole village is filled with joy, and old and young, men and women, hurry out to meet him, and conduct him, with the sound of brazen cymbals, dancing in long lines to the house of the female he admires, whose family likewise comes out to greet him with dances, and provide him a seat, and give him meat and drink. He still holds the bloody head in his hand, and puts part of the food into its mouth, after which, the females of the family receive the head from him, which they hang up to the ceiling over the door.

If a man's wife die, he is not permitted to make proposals of marriage to another, till he has provided another head of a different tribe, as if to revenge the death of his deceased wife. The heads procured in this manner, they preserve with great care, and sometimes consult in divination. The religious opinions connected with this practice are by no means correctly understood. Some assert, that they believe that every person whom a man kills in this world, becomes his slave in the next. The Idaan, it is said, think that the entrance into Paradise is over a long tree, which serves for a bridge, over which it is impossible to pass without the assistance of a slave slain in this world.

The practice of stealing heads causes frequent wars among the different tribes of the Idaan. Many persons never can obtain a head, in which case they are generally despised by the warriors and the women. To such a height it is carried, however, that a person who had obtained eleven heads, has been seen by Mr. Burn, and he pointed out his son, a young lad, who had procured three.

We shall conclude this article, by the following extract, respecting the largest diamond yet known.

The most remarkable circumstance connected with Mattan is, that the Rajah possesses the finest and largest diamond in the world, which has hitherto been discovered. This diamond, which is said to be of the finest water, weighs 367 carats. The celebrated Pitt diamond weighs only 127 carats. The Mattan diamond is shaped like an egg, with an indented hollow near the smaller end It was discovered at Landak about 90 years ago; and though the possession of it has occasioned numerous wars, it has been about 80 years in the possession of the Mattan family. Many years ago, the governor of Batavia sent a Mr. Stuvart to ascertain the weight, quality, and value of this diamond, and to endeavour to purchase it; and in this mission, he was accompanied by the present Sultan of Pontiana. After examining it, Mr. Stuvart offered 150,000 dollars for the diamond, the sum to which he was limited; and, in addition to this sum, two war brigs, with their guns and ammunition, together with a certain number of great guns, and a quantity of powder and shot. The Rajah, however, refused to deprive his family of so valuable a hereditary possession, to which the Malays attach the miraculous power of curing all kind of diseases, by means of the water in which it is dipped, and with which they imagine the fortune of the family is connected.

Art. XIII. *A Review of the Genus* Amaryllis. *By* John Bellenden Ker, *Esq.*

The group of species comprized under the generic appellation Amaryllis, is not surpassed in general splendour of inflorescence by any within the limits of the vegetable system. In these islands the genus is wholly exotic. Its first spontaneous appearance, in geographical relation to them, is in the southern-

most parts of Europe ; but by few species, and with little lustre or variety. The throng and pomp of pageantry are only displayed within or on the borders of the tropics. In the northern states of America we know of only one species.

The present revisal of the genus was not suggested so much by the weight of any new matter we have to offer, as by the wish to concentrate information which as yet remains dispersed at unconnected points, and to render it more readily available to the student. The last general enumeration of AMARYLLIS, worthy of notice, is contained in a part of Willdenow's edition of the "Species Plantarum" printed as far back as 1799. Since that period new species have been discovered and recorded, others dismissed and assorted in more convenient groups, and a still greater portion illustrated which were before obscurely or imperfectly known.

We hear with pleasure that another edition of the Linnæan System of vegetables, augmented to the instant time by Drs. Roemer and Schulte, is nearly ready for the press.* An enterprize, by the by, that still defies the energy of our countrymen. We confess ourselves desirous that the recent acquisitions, now scattered in detached and miscellaneous works or straying in the labyrinth of preludes to a natural method, should be enrolled in the ingenious and ready system, to the use of which we have the most of us been disciplined.

Natura in reticulum sua genera connexit, non in catenam: homines non possunt nisi catenam sequi, cum non plura simul possunt sermone exponere. Haller helv. ii. 130.

AMARYLLIS.

Methodo Linnæano. Classis et Ordo. HEXANDRIA MONOGYNIA.
Methodo Naturali Jussieui. Divisio primaria. MONOCOTYLEDONES.

* This work is noticed in the account of new books given in another part of this Number, which may be referred to.

CLASSIS III. Stamina perigyna.
ORDO. NARCISSI. *Div.* II. Germen inferum.
——— AMARYLLIDEÆ. *Brown. prod. flor. nov. holl.* 296.
Sect. I. Radix Bulbosa. Flores spathacei, umbellati, rarò solitarii.

Conspectus generum divisionis ordinalis.

CALOSTEMMA. Germen uniloculare.
PANCRATIUM. Corona filamentorum connectilis.
NARCISSUS. Corona includens filamenta infra ejus basin intra tubum inserta.
AMARYLLIS. Limbus turbinato-patens. Filamenta libera summo tubo infra faucem inserta.
BRUNSVIGIA. Capsula clavato-turbinata, triquetra lobis compressis; oligosperma.
CYRTANTHUS. Corolla clavata limbo breviore fauce; filamenta fauci supra tubum inserta.
CRINUM. Corolla regularis hypocrateriformis.
HÆMANTHUS. Capsula baccata, loculis monospermis.
STRUMARIA. Stylus strumosus vel strictissimus et robustior.
LEUCOJUM. Antheræ apice dehiscentes.
GALANTHUS. Corolla laciniis petalodibus, 3 parvis emarginatis.

GENUS.

AMARYLLIS. *Spatha* terminalis, bivalvis rariùs indivisa. *Flores* 1—multi, umbellati, *bracteis* distincti. *Corolla* erecta ad subcernuam, infundibuliformis ad hexapetalodi-rotatam; *limbo* profundiore fauce, sæpè irregulari. *Filamenta* glanduloso disco vel summo tubo infra faucem insita, erecto-divergentia ad fasciculato-declinata, profundiùs inclusa ad rarò subexserta. *Antheræ* introrsùm versæ, versatiles, sæpè vibratæ. *Germen* inferum; *loculamenta* collaterali-disperma ad cumulato-polysperma. *Stylus* inclinatus, curvatus. *Stigmata* 3 replicata vel 1 subtrifidum depressum

v. apertum. *Capsula* oblata, triloba lobis rotundatis, trilocularis, trivalvis valvis medio septigeris. *Semina* biseriata, globosa ad foliaceo-complanata, raró subarillatìm immersa funiculo crasso fungoso, modò bulboso-laxata rariùs solitaria: *albumine* carnoso: *embryone* recto.

Bulbus *concentricè tunicatus*. Folia, 1 *ad plurima, bifaria ad multifaria, linearia ad petiolata cum laminâ oblongâ, scapi isocrona v. tardiora. Os tubi non raró sertulo brevi membranoso fimbriatìm squamatìm v. alitèr fisso v. integerrimo arctè extra basin filamentorum cinctum. Haud nimìs faciendum limbi inflexio; cùm sæpè solùm directione corollæ pendat; umbellæ enim videndæ in periphæriâ nutante irregulariflore, in centro erectiore regulariflore.*

Species.

I. *Uniflorœ. Spatha latere dehiscens. Folia bifaria.*

1. *colchiciflora.* A. foliis linearibus obliquè tortis lucidis; flore radicali, aphyllo, erecto: staminibus erectis.

 Amaryllis colchiciflora. *nob. in Curt. Mag. fol.* 1089: *commutatâ synonymiâ cum sequente.*

 Sternebergia colchiciflora. *Kitaib. et Wald. ic. pl. hung.* 2. *t.* 157. *Marshall von Bieberstein taur. caucas.* 1.261.

 Narcissus autumnalis. *Clus. hist.* 1. 164. *cum ic.*

 Luteâ minor. *Bulbus* pusillus ovatus, indusio, fusco. *Folia* vernalia, subquina, digitalia, lineâ parùm latiora, erecta, obtusa, carinata, planiuscula. *Flos* flavus, odoratus, autumnalis: *tubus* strictus, partim subterraneus, *limbo* longior. *Antheræ* 4-loculares. (*Kit.*) *Capsula* succrescente scapo extrusa humo, oblonga, subtrigona. *Semina* plura (5) in loculo, globosa, nigra, funiculo fungoso crasso albo subarillatè immersa.

 Patria: Hungaria, Tauris.

2. *clusiana.* A. foliis loratis planis glaucissimis laxiùs spirali-obliquatis flore radicali, aphyllo, erecto: staminibus erectis.

Amaryllis clusiana. *nob. in Curt. Mag. fol.* 1089; (*commutatis cum antecedente synonymis.*)

Narcissus persicus. *Clus. hist.* 1. 163. *cum ic.*

Bulbus globoso-ovatus, indusio fuscescente. *Folia* vernalia, subquaterna, cæsia, lorata, plana, erecta. *Flos* autumnalis, ex flavo pallescens, odore ingrato viroso; laciniis externis limbi latioribus, hamato-mucronatis. *Stam.* alternè longiora. *Capsula* in brevi scapo emicans humo.

Clusio allata ex Constantinopoli.

3. *exigua.* A. foliis filiformibus; spatha acuta; tubo brevi; flore erecto: staminibus erectis.

Amaryllis exigua. *Schousboe maroc. part.* 1. 160. *edit. german. p.* 1. 146. *Roth neue beytrage.* 190. *Id. ann. of bot.* 2. 26.

Bulbus rotundo-ovatus, indusio fusco. *Scapus* teres tenuis digitalis. *Folia* 1-3 longitudine ferè scapi. *Spatha* 1-phylla longitudine pedicelli floris. *Corolla* lutea, erecta, campanulata tubo brevi, laciniis æqualibus lineari-lanceolatis, obtusis, nervo intensiùs flavescente per medium dorsum ducto. *Filamenta* subæqualia, fermè longitudine corollæ. *Stylus* filiformis.

Patria: ager tingitanus. Schousboe.

4. *citrina.* A. spatha indivisa obtusa; corolla subcampanulata erecta, laciniis linearibus emarginatis: stigmate trilobo. *Smith prodr. flor. græc.* 1. 221.

Amaryllis citrina. *Flor. græc. t.* 311.

Haud aliundè nobis nota. Tabula et descriptio ex Florâ Græcâ allegatæ nondum editæ.

Patria: Græcia. In monte Olono Peloponesi, sero autumno florens. S.

5. *lutea.* A. foliis pluribus carinatis; flore erecto, in scapo ancipiti sessili, laciniis ovali-oblongis obtusis: staminibus erectis.

Amaryllis lutea. *Linn. sp. pl. ed.* 2. 1. 420. *Hort. Kew.* 1. 415. *ed.* 2. 2. 223. *Curt. Magaz.* 290. *Willd. sp. pl.* 2. 50. *Redouté liliac.* 148.

Narcissus Autumnalis major. *Clus. hist.* 164.

Bulbus globoso-ovatus, indusio nigricante. *Folia* 3-plura, lorata, canaliculata, atrovirentia, lucida, semunciam lata ultràve. *Scapus* brevis, anceps, robustior. *Corolla* lutea, subbiuncialis, turbinato-campanata, tubo vix $\frac{1}{3}$ partem limbi æquante, laciniis concaviusculis infernè versùs angustatis, extimis 3 ferè ex tertiâ parte latioribus; intimis cum fine rotundiore. *Stamina* adnata tubo, conniventia, $\frac{1}{4}$ breviora limbo, invicèm longiora: *antheræ* lineares, versatiles, luteæ. *Stigmata* obsoletè trina, inæqualia (anne constantèr?)

Habitat Europam Australem; Orientem.

II. *Uni-v. subuniflorœ. Spatha divisa v. subdivisa. Folia bifaria.*

6. *chloroleuca.* A. pedicellato-subbiflora; folio lineari; tubo brevissimo, limbi erecti laciniis apice rotundatis: staminibus erectis. *(Vide tab.* VIII. *fig.* 1.*)*

Amaryllis ochroleuca. *nob. (ex tabulâ in vol.* 1 "*Adumbrationum Francisci Bauer" in Mus. Banks.)*

Bulbus ovato-oblongus indusiis pullis, vix magnitudine ovi columbini. *Folium* unicum, semipedale, ligulato-lineare, planum, sublongius *scapo* viridi tereti. *Spatha* acuta pedicellis 1-sesquiuncialibus altior, valvis arrectis. *Germen* viride breve oblongum. *Corolla* chloroleuca cum striis externis obsoletè lateritiis, sesquiunciâ profundior, turbinato-campanata; tubo subnullo viridiusculo germinis continuo; *laciniis* obovato oblongis, concaviusculis, mucronulatis. *Stam.* fundo corollæ inserta, erecto-conniventia, alternè longiora, ex tertiâ parte breviora limbo: *antheræ* pallidæ. *Stylus* æquans corollam: *stigmata* replicata. Nobis tantùm ex tabulâ Domini Francisci Bauer in Museo Banksiano, ad plantam vivam Horto Kewensi floridam adumbratâ nota. Hanc quondam perperàm habuimus pro AMARYLLIDE *Pumilione.*

Nescimus patriam.

7. *Pumilio.* A. flore sessili, folio lineari unico; laciniis tubo longioribus, ovato-oblongis, reflexis, acutis: staminibus inclinatis.

Amaryllis Pumilio. *Hort. Kew.* 1. 415. *ed.* 2. 2. 223. *Willd. sp. pl.* 2. 50.

Folium infernè angustatum. *Scapus* teres, palmaris, virescens. *Flos* erectus. *Spathæ* foliola lineari-subulata, basi invicèm amplexa, tubo corollæ longiora, virentia. *Corollæ* tubus infundibuliformis uncialis albidus externè lineis sex elevatis notatus, internè lineis sex rubris cum prioribus alternantibus. *Limbus* extùs albidus intùs lateritius. *Filamenta* inclinata, filiformia, tubo infrà faucem inserta, apice inflexa albida, 3 alterna breviora. *Antheræ* oblongæ incumbentes luteæ. *Germen* oblongum, *Stylus* filiformis albidus; *stigma* trifidum, laciniæ lineares rubicundæ apice albæ. *Linn. fil. in Hort. Kew.*

Patria: Africa Australis; Caput Bonæ Spei.

8. *pudica.* A. 1-flora; corolla subregulari, erectiuscula, turbinato-campanulata, subconnivente, lacinia una staminibus inclinatis retrusa. (*Vid. tab.* VIII. *fig.* 2.)

Amaryllis pudica. *Ex tabulâ ad plantam anno* 1785 *in H. R. Kewensi floridam à Dom. R. A. Salisbury egregiè depictâ.*

Bulbus non visus, neque *folia;* hæc tardiora flore. *Scapus* humilis. *Spatha* 2-valvis, erecta, acuminata. *Corolla* biuncialis ultràve, albo-rubescens; *tubus* vix semuncialis, crassus, sexsulcus; *limbus* ad tubum usque partitus, laciniis elongato-lanceolatis, subæqualibus, acuminatis, striâ intensiùs rubente secundùm medium dorsum ductâ notatis, imbricato-conniventibus, præter unicam fasciculo staminum inclinantium pressam retrocedentem. *Stamina* breviora limbo. *Stigmata* 3, inclusa. Exemplarium habetur in Herbario Banksiano itidem Horto Kewensi floridum, omnibus consentiens cum præsenti plantâ præterquam flore sessili, non pedicellato.

Patria: Caput Bonæ Spei. Masson adduxit.

9. *tubispatha.* A. foliis paucis ligulato-linearibus; spatha 1-

phylla vaginante erecta bifida, bis breviore pedicello; corolla regulari, subnutante: tubo subnullo.

Amaryllis tubispatha. *L'Heritier sert. angl.* 9. *Willd. sp. pl.* 2. 51. *Nob. in Curt. magaz.* 1586. *cum tab.*

Bulbus subglobosus indusio fusco. *Folia* subtrina, 1—2 lineas lata, obtusula, subæquantia *scapum* (nunc binos) compresso-teretem spithamæum striatum fistulosum. *Spatha* cylindracea, sphacelata, acuminata, segmentis oppositis. *Pedicellus* teres erectus, flori subodorato æqualis. *Germen* oblatum, cylindraceum, rotundatè trilobum, trisulcum, viride, loculis polyspermis. *Corolla* nascens cum aliquo rubore suffusa, adulta candicans, de medio circà infernè versùs virens, turbinato-vel cunei-formi-campanulata at angustius et contractiùs, subbiuncialis, laciniis infrà brevissimè connexis oblongis, deorsùm attenuatis, laminâ ellipticâ rectiore brevè acuminatâ; *exterioribus* penè bis latioribus, imbricato-complectentibus *interiores* subbreviores. *Stamina* duplo breviora limbo, brevissimè adnata, laxè fasciculata, declinata: *antheræ* pallidæ, lineares, versatiles. *Stylus* longior, at inclusus: *stigmata* replicata. *Semina* rotunda nigra.

Patria: America meridionalis, Buenos Ayres. Jamaica? in montibus.

10. *Atamasco.* A. foliis pluribus ligulatis infernè attenuatis spatha bifida includente pedicellum; corollæ erectæ laciniis acuminatis: staminibus erectis.

Amaryllis Atamasco. *Linn. sp. pl. ed.* 2. 1. 420. *L'Heritier sert. angl.* 10. *Hort. Kew.* 1. 416. *ed.* 2. 2. 223. *Curt. magaz.* 239. *Redouté liliac.* 31. (var. minor.) 454. *Willd. sp. pl.* 2. 51. *Pursh amer. sept.* 1. 222. *Schkuhr botan. handb. t.* 90.

Lilio-narcissus virginiensis. *Catesby carol.* 3. 12. *t.* 12.

Narcissus virgineus. *Parkins. paradis.* 89. *fig.* 1.

Bulbus ovato-oblongus indusio fusco. *Corolla* magnitudine varia, albida, junior plus magis effusa rubore purpureo vel carneo præsertim ad tubum et per medium dorsum laciniarum; tubus brevis, laciniæ limbi lanceolatæ re-

curvo-patentes, infrà turbinato-contractæ. *Stamina* erecto-patentia, subæqualia, plurimùm breviora limbo. *Scapus* teres semipedalis ad pedalem; non robustus. *Sem.* rotunda; anguloso-pressa, nigra.

Patria: Carolina, Virginia.

III. *Subuniflorœ. Tubus coronatus. Folia bifaria.*

10. *minima.* A. (tubo squamato) uniflora; limbo campanulato, æquali, subroseo: staminibus erectis. *Kunth.*

Amaryllis minima. *Humboldt et Bonpland nov. gen. et sp. plant. amer. æquin. à Kunth. v.* 1. *p.* 221.

Bulbus ovatus magnitudine cerasi minoris. *Folia* linearia, obtusa, plana, striatula paulò breviora scapo. *Scapus* teres pollicaris. *Spatha* (indivisa?) acuminata, basi inflata, striata, tenuissima, albida, flore duplo brevior. *Corolla* erecta alba vel rosea; tubo cylindraceo; limbo sexpartito. *Germen* 3-quetrum. *Stigmata* 3. Kunth.

Patria: Mexico, in temperatis humidis Novæ Hispaniæ juxta Real del monte et Cerro ventoso. H. et B.

11. *nervosa.* A. (tubo squamato) pedicellato-uniflora; limbo campanulato æquali albo, laciniis ovato-oblongis, acutis, nervosis: staminibus erectis. *Kunth.*

Amaryllis nervosa. *Humboldt et Bonpland nov. gen. et sp. pl. amer. æquin. à Kunth. v.* 1. *p.* 221.

Bulbus non visus. *Folia* angustissima, linearia, plana, striata, glabra, 10—11-pollicaria. *Scapus* 6—8-pollicaris, teres. *Spatha* vix striata, oblongo-lanceolata, acuminata tenuissima, (indivisa?), subpollicaris. *Flos* sesquipollicaris, inodorus. *Pedicellus* teres, spatham vix superans. Laciniis *limbi* sexpartiti basi viridibus. Stamina alternè breviora. *Germen* subglobosum, 3-gonum. *Stylus* staminibus longior. *Stigmata* 3. *Semina* bulbiformia. *Kunth.*

Patria: Mexico, in convallibus araguensibus provinciæ caracasanæ juxta Cura, villam Comitis de Tovar. H. et B.

12. *tubiflora.* A. (tubo sertato?) subbifolia, foliis ligulato-attenuatis; flore sessili in scapo.

Amaryllis tubiflora. *L'Heritier sert. angl.* 10. *Willd. sp. pl.* 2. 51.

Lilio-Narcissus croceus monanthos. *Feuillée peruv.* 3. 29. *t.* 20.

Flos sessilis, croceus, triuncialis, infundibuliformis, recurvo-patens. *Scapus* pedalis. *Folia* 2 ligulato-acuminata, 9 uncias longa, 3 lineas lata.

Habitat Peru circà Lima. Feuillée.

13. *flammea.* A. (tubo squamato) corollæ laciniis semiconvolutis supernè patentibus reflexis, genitalibus brevibus erectis. R. et P.

Amaryllis flammea. *Ruiz et Pavon flor. peruv.* 3. 56. *t.* 286. *f. b.*

Lilio-narcissus monanthos coccineus. *Feuillée peruv.* 3. 29. *t.* 21.

Scapus pedalis. *Folium* unum ligulatum acuminatum carinatum, brevius scapo: post florescentiam folia plura consimilia. *Spatha* pedicellato-1-flora, decidua, appressa, lançeolata. *Corolla* flammeo-coccinea: *tubus* brevis: *limbus* bipollicaris, cylindraceo-campanulatus, fauce turbinatus, indè recurvo-patens, intùs ore tubi *squamis* parvulis membranosis crenulatis cinctus. *Filamenta* erecta, $\frac{1}{3}$ parte breviora limbo, flammea. *Stylus* flammeus; *stigmata* 3, replicata.

Patria: Peru. Ruiz et Pavon.

14. *peruviana.* A. (tubo squamato) eorolla campanulata patentiuscula, staminibus erectis, stylo declinato; bulbo bulbillis obvallato. R. et P. (*sub aureâ.*)

Amaryllis peruviana, *nob. in Curt. Mag. fol.* 1089. *Poiret suppl. encyc. Lamarck* 1. 315.

Amaryllis aurea. *Ruiz et Pavon flor. peruv.* 3. 56. *t.* 286. *f. a.*

Bulbus rotundus indusio nigro nitido. *Folia* plura (5) ligulato-attenuata, carinata, acuminata. *Flos* peduncu

latus, coloris aurei, cylindraceo-infundibuliformis; tubo brevi in faucem turbinatam ampliato; limbo recurvò-patente. *Filamenta* erecta, æqualia. *Stylus* declinatus. *Faux* cincta squamis denticulatis membranaceis. Præcedenti simillima species.

Patria: Peru. R. *et* P.

15. *maculata.* A. spatha lineari, flore pedunculato, genitalibus declinatis. *L'Heritier sert. angl.* 10.

Amaryllis maculata. *Willd. sp. pl.* 2. 52.

Scapus punctis lineatis maculatus. *Corolla* campanulata. *L'Herit.*

Habitat in Chili. Dombey.

16. *formosissima.* A. (tubo fimbriato) corolla nutante, rictu difformi divaricato: staminibus infernè per imi labii tubuloso-involutas lacinias complexis.

Amaryllis formosissima. *Linn. sp. pl. ed.* 2. 1. 420. *Curtis Magaz.* 47. *Redouté liliac.* 5. *Willd. sp. pl.* 2. 52. *Hort. Kew.* 1. 416. *ed.* 2. 2. 224.

Lilio-Narcissus jacobæus, flore sanguineo nutante. *Dillen. hort. eltham.* 195. *t.* 162. *f.* 196.

Spreikelia Heisteri. *Trew flor. imag. t.* 24.

Narcissus latifolius indicus rubro flore. *Clus. hist.* 2. 157.

Bulbus indusio nigricante. *Folia* plura lorato-elongata, angustiora, canaliculata, margini et carinâ tactui scabriuscula, infrà nervosa. *Scapus* fusco-rubens, vix æquans folia. *Spatha* bivalvis foliolo uno lineari incluso, altero folliculoso bifido, altiore *pedicello* crasso. *Flos* e majusculis, puniceus, micans, inodorus. *Corollæ tubo* brevissimo, membranaceâ fimbriâ coronato; *limbo* infernè breviùs arctato, indè dispanso in rictum biformem, *laciniis* lanceolatis longiùs acuminatis nervosis infrà angustatis; tribus *labii summi* stellato-divergentibus, mediâ erectâ, binis lateralibus oppositis; tribus *imi* propendulis, infrà in tubum trigonum convolutis indè explicatoribus. *Filamenta* rubra, fasciculata, corollæ æqualia, tubulo fermè obsoleto adnata, secundùm laci-

niam imam deflexa, apice incurvata; *antheræ* luteæ incumbentes, vibratiles. *Stylus* filiformis robustus ruber; *stigmata* 3 replicata, antheras exsuperantia.

Patria: America Meridionalis.

IV. *Bi-multifloræ. Tubus coronatus. Folia bifaria.*

17. *aulica.* A. tubo coronato membranâ brevi integrâ virente.

Amaryllis aulica. *nob.*

Incerti sumus de loco hujus speciei. Florem Horto regio Kewensi carptum unicâ tantùm vice et fugitivo visu præteritâ æstate conspeximus. Ut memoria verò est, flos solitarius, majusculus, irregularis, coccineo-splendens, tubi membranâ simili AMARYLLIDIS *calyptratæ* sed viridi. Vix ejusdem speciei varietas?

Patria: Brasilia.

18. *calyptrata.* A. (membranâ tubi decolori integrâ) pedunculato-biflora; limbo semiringente, nutante, laciniis extimis apice incurvo-conniventibus, intimis recurvo-divaricantibus.

Amaryllis calyptrata. *nob. in Botanical Register.* v. 2. 164, *cum tab.*

Folia coriaceo-firma, erecto-patentia, lanceolato-lorata, acuta, clathrato-venosa, 2 pedes cum dimidio longa, ecunciam ad duas uncias usque lata. *Scapus* (modò plures successivi) triplo crassior pollice, parùm brevior foliis, estriatus, glaucus, basi purpurascens. *Flores* maximi, diutini, 5-unciales, subflavido-virentes, modò punctis minutis densis lateritiis striatìm confluentibus rubricati; *pedunculi* parùm germine longiores, calamum crassi. *Germen* unciale obesius pedunculo, exsulcum. *Corollæ* rictus transversìm latior; *tubus* rectus bis brevior limbo, germini subisoperimeter, intensiùs virens; *limbus* infrà imbricatus, clathrato-venosus laciniis lanceolatis acutis, undulatis, subæqualibus, exterioribus 3 dorso gibbosioribus, summâ mediâ antrorsùm depressâ, arcuatâ. *Stamina* exserta, fasciculata, declinata, subrubentia;

antheræ violaceæ, polline flavo. *Stylus* crassior, longior: *stigmata* revoluta. *Capsula* oblata-ovata, triventri triloba, suprà arctata, lobis pulvinato-rotundis suprà gibbis ventre decurvo-tumido. *Semina* latere interiori invicèm incumbentia, fumosa, foliaceo-complanata, elliptico-oblonga, unciam longa, alâ latissimâ; *nucleo* juxta marginem supernam posito.

Patria: Brasilia.

19. *chilensis.* A. (tubo squamato) subbiflora; foliis pluribus linearibus; spatha pedunculis longiore; tubo brevi: squamis faucialibus 3-4-fidis.

Amaryllis chilensis. *L'Heritier sert. angl.* 11. (*amandato synonymo Feuillæi ad* flammeam.) *Ruiz et Pavon flor. peruv.* 3. 56; *absque icone.*

Bulbus subrotundus. *Folia* linearia, utrinque attenuata, compressa, obsoletè lineata, carne spongiosâ favosâ. *Scapus* pedalis, teres, cavus, purpurascens, rariùs uniflorus. *Spatha* albido-rosea. *Corolla* bipollicaris, tubus brevis, luteus, limbus aurantiacus, laciniis lanceolatis patulis. *Filamenta* declinata, dimidio breviora corollâ. *Decerptè ex Ruiz et Pavon.*

Patria: Chili, Peru. Colonis, Hamanca encarnado.

20. *equestris.* A. (tubo fimbriato) 2-3-flora, pedicellis spatha erecta brevioribus, tubo filiformi horizontali, limbo obliquè patulo, sursùm curvo. *Hort. Kew.* 1. 417.

Amaryllis equestris. *Jacq. hort. schoenb.* 1. 33. *t.* 63. *Curt. Magaz.* 305. *Willd. sp. pl.* 2. 54. *Redouté liliac.* 32. *Hort. Kew. ed.* 2. 2. 224; (*excluso synonymo Andrews's reposit.* 358. 1; reginæ *allocando*)

Amaryllis dubia. *Linn. amæn. acad* 8. 254.

Lilium americanum puniceo flore Belladonna dictum. *Herm. parad.* 194. *t.* 194.

Lilium rubicundum. *Merian surinam. t.* 22.

Folia subquaterna, lorata, utrinque attenuata, unciam ad summum lata, breviora *scapo* pedali tereti fistuloso

glauco. *Flores* inodori, subtriunciales, miniati; *faux* patens stellâ chloroleucâ. *Tubus* subuncialis calamum crassus. *Limbus* rictû obliquo divaricans. *Stamina* fasciculata, declinata.

Patria: America meridionalis; Barbada.

21. *miniata.* A. (tubo fimbriato) 2-4-flora, corolla ringente cernua, tubo brevissimo.

Amaryllis miniata. *Ruiz et Pavon.* 3. 57; *flor. peruv. absque icone.*

Folia lorata, utrinque attenuata. *Scapus* (nunc 3) glaucus cavus. *Flores* subtripollicares, pedunculati, incarnato-miniati: *faux* patens stellâ viridi-albâ: *tubus* vix trilinearis; *lacinia* suprema reflexa, ima angustior. *Stamina* declinata. *Bulbus* sectus aere expositus minii acquirit colorem. Separamus præcedente ob corollam cernuam dictam et tubum trilinearem: in *equestri* tubus subuncialis, corolla nutans.

Patria: Peru.

22. *reginæ.* A. (tubo fimbriato) 2-4-flora, foliis paucis loratis acuminatis, costâ carinatis, corolla subcernua, profundè turbinata, supra campanulato-subringente: tubo brevi, crasso.

Amaryllis reginæ. *L'Heritier sert. angl.* 12. *Hort. Kew.* 1. 416. *ed.* 2. 2. 224. *Curt. Magaz.* 453. *Willd. sp. pl.* 2. 3. *Redouté liliac.* 9.

Amaryllis brasiliensis. *Andrews's reposit.* 35.

Scapus (nunc bini) duplo brevior foliis, vix pedalis, subcompressus. *Flores* inodori, subquaterni, rarò plures; *pedicellis* brevioribus *spathâ* erectâ. *Corolla* triuncialis magisve, coccinea, *fauce* chloroleuco stellata; *laciniis* elongato-ovalibus, lanceolatis, infernè angustatis, e tubo vix longiore germine turbinato-divergentibus in campanam latam non revolutam. *Stamina* coccinea, parùm breviora limbo, declinata. *Folia* non glauca.

Patria: America meridionalis.

23. *advena*. A. (tubo fimbriato) pluriflora; foliis 1-pluribus lineari-ligulatis involutis glauciusculis; pedunculis subæqualibus corollæ nutanti bilabiato-divaricatæ; laciniis lingulato-lanceolatis, remotis.

Amaryllis advena. *nob. in Curt. Mag.* 1125; *cum tab. Hort. Kew. ed.* 2. 2. 225.

Lilio-Narcissus polyanthos, flore internè rubro, intùs luteo et rubro vario. *Feuillée peruv.* 3 30. *t.* 21.

Bulbus subrotundus, indusio nigricante. *Folia* 1—6, involuto-concava, dorso rotundata, obtusula, tertiam partem unciæ circitèr lata, longiora subbipedalia. *Scapus* compresso-teres, calamo anserino vix crassior, folia subæquans. *Flores* 4—5, subbiunciales, miniati, extùs virore suffusi, intùs ad faucem flavo-striati. *Spatha* sphacelata, lineari-lanceolata. *Corollæ tubus* brevis subæqualis germini, melle impletus; *limbus* in duo consimilia labia æquabilitèr dispansus; *laciniæ* utriusque labii radiato-distantes recurvæ, externæ 3 sublatiores, mucronatæ. *Filamenta* $\frac{1}{4}$ breviora limbo, fasciculata, declinata, supernè rubra alternè plurimùm breviora; *antheræ* flavæ vibratiles, lunulatæ. *Stylus* triquetro-filiformis, supernè versùs sensìm crassior; *stigmata* replicata, canaliculato-linearia.

Patria: Chili.

24. *bicolor*. A. (tubo bicorni-squamato) multiflora; foliis lorato-acuminatis; tubo brevi, laciniis lanceolatis erectis, supernè patulis.

Amaryllis bicolor. *Ruiz et Pavon. flor. peruv.* 3. 57; *absque Icone.*

Folia erecto-patentia. *Scapus* anceps. *Corolla* sesquipollicaris subcampanulata, rubra, apice virens. *Squamæ tubi* bicornes. *Filamenta* erecta. *Capsula* trigona. *Semina* nigra.

Patria: Peru. Ruiz et Pavon.

V. *Bi-multiflora. Tubus nudus. Folia bifaria.*

25. *reticulata*. A. pluriflora: foliis pluribus, lorato-oblongis, infernè versùs involuto-attenuatis; corolla subcernua longè cucullato-tubulosa; limbo obliquè ringente.

Amaryllis reticulata. *L'Heritier sert. angl.* 12. *Hort. Kew.* 1. 417. *ed.* 2. 2. 225. *Andrews's reposit.* 179. *Thompson's bot. displ.* 7. *Redouté liliac.* 424. *Curt. mag.* 657.

β major; foliis striâ mediâ longtudinali argenteo-candicante à supino pictis.

Bulbus rotundus indusio pullo. *Folia* 4—5, intensè viridia, 7—9-uncialia, unam ad sesquiunciam lata, involuta, costâ mediâ carinata, acuta. *Scapus* glaucus, subcompressus, parùm supra semipedalem. *Flores* 4—5, 4—5-pollicares, pedunculati. *Corolla* lilacino-punicans, clathrato-venosa, fauce albicans; tubus ultra unciam longus, deindè angustè turbinatus; limbi labium summum reflexum; laciniæ ovali-lanceolatæ. *Germen* subcoloratum, oblongum, rotundatè trigonum. *β*. seminibus sata, persistit.

Patria: Brasilia, Rio Janeiro.

16. *crocata.* A. pluriflora; spatha sphacelata pedicellis vix æquali; corollâ subcernuâ, inæquali, divaricato-ringente, tubo subæquante germen; laciniâ summâ remotâ, cæteris imam duplo angustiorem versùs obliquatis.

Amaryllis crocata. *nob. in Botanical Register; vol.* 1. 38. *cum tab.*

Bulbus indusio pallidè fusco. *Folia* plura, lorata-lanceolata fine obtuso, striata, lineolis interruptè cancellata, sesquipedalia, latiora vix 2 uncias transversa, non glauca. *Scapus* cæsius, bipedalis, pollice crassior, columnaris, basi purpurascens. *Spatha* reflexa, striata, sub- quadriflora. *Pedunculi* biunciales. *Germen* viride oblongum obtusè trigonum, crassius ferèque longius tubo virente: *ovula* numerosa, cumulata, complanata. *Corolla* subquadriuncialis, crocata, venis parallelis striata; *faux* brevis, turbinato-aperta, intùs stellata radiis senis chloroleucis rhombeo-lanceolatis; *limbus* radiato-reflexus, *laciniæ* ovali-lanceolatæ, laxiùs undulatæ, suprema remota, quasi per se pro labio habenda, laterales superiores supernè latere utroque reflexæ; ima obtusa. *Stamina* decli-

nata, alternè longiora, ¼ circiter breviora limbo. *Stigmata* profundiùs discreta, alba. *Semina* foliaceo-complanata.

Patria: Brasilia.

27. *rutila.* A. subbiflora; spathâ aridâ reflexâ, sublongiore pedunculis; limbo turbinato-bilabiato, rictu radiato obliquo, laciniis 3 summis conniventibus recurvis, infimis 3 porrecto-divergentibus: imâ angustâ, remotâ.

Amaryllis rutila. *nob. in Botanical Register; v* 1.23; *cum tab.*

Bulbus subrotundus, maculis miniatis sæpè pictus. *Folia* 3-plurima, sublanceolato-lorata, subpedalia, infra unciam lata. *Scapus* nunc foliis lateralis, compresso-teres, pennam olorinam crassus, glaucus, pedalis. *Germen* oblongum, obtusè trigonum, bis brevius tubo: *ovula* numerosa cumulata complanata. *Corolla* ferè quadriuncialis, miniato-micans, stellâ fauciali chloroleucâ sexradiatâ hians; tubus semuncialis trigonus germini isoperimeter; laciniis elongato-lanceolatis, exterioribus latioribus, lateralibus 2 summis supremam versus obliquatis: infimâ lineari-lanceolatâ. *Filamenta* declinata, miniata, longiora ⅓ breviora limbo, alterna plurimùm breviora. *Antheræ* luteæ, vibratiles. *Stylus* miniatus; *stigmata* alba, profundiùs replicata. *Equestri* et *miniatæ* propinquissima; fauce nudâ utrisque diversa.

Patria: Brasilia, circà pagum Sti Pauli.

28. *blanda.* A. foliis plurimis oblongo-loratis obtusis; pedunculis divaricatis, æqualibus flori: tubo brevi turbinato; limbo recurvo-patente, obscurè bilabiato, nutante, subundulato.

Amaryllis blanda. *nob. in Curt. magaz.* 1450; *cum tab.*

Bulbus nunc ovo olorino duplo major, indusio pallido-fuscescente. *Folia* scapo tardiora, extima 2 breviora lanceolato-oblonga; interiora lorata lanceolata, acumine obtuso brevi, lætè viridia, nitida, costâ mediâ pallidiore carinata, tripedalia, latitudine sesqui-biunciali. *Scapus* 3-pedalis robustus. *Flores* plurimi, quadriunciales, turbinato-cam-

panati, infernè flavescentes indè ex albo incarnati, inodori, *pedunculis* viridibus, crassis, strictis. *Germen* obovatum, rotundatè trigonum, subduplo brevius tubo. *Corolla* è tubo brevi turbinato recurvo-patentissima, fauce pallidè flavescens, laciniis ovali-lanceolatis laxiùs undulatis, infernè versùs angustatis. *Stamina* fasciculata, declinata, ex unâ quartâ parte breviora limbo; *antheræ* luteæ incumbentes, vibratæ, demùm lunulatæ. *Stigma* depressum, subtrigonum.

Patria: Caput Bonæ Spei.

29. *Belladonna.* A. pedicellato-multiflora; foliis ligulatis canaliculatis, corollâ subregulari, turbinato-campanulatâ, nutante, nusquam flexâ, laciniis suprà recurvis; tubo subnullo.

Amaryllis Belladonna. *Linn. sp. pl.* 1. 421. *L'Heritier sert. angl.* 12. *J. Miller illustr. Hort. Kew.* 1. 417. *ed.* 2. 2. 225. *Nobis in Curt. magaz.* 733. *Willd. sp. pl.* 2. 54. *Redouté liliac.* 180; (*exclusis passìm Sloane, Herman, Seba, Merian, et Swartz* equestrem *intelligentibus*).

Lilionarcissus indicus fl. elegantissime purpurascente. *Weinm. Phyt.* 3. 276. *t.* 653. *fig. A.*

Narcissus polyanthos liliacino flore. *Rudbeck Elys.* 2. 48 *fig.* 7; (*figura Ferrarii*).

Narcissus indicus liliaceus diluto colore purpurascens. *Ferrarius floril.* 117. *t.* 121.

β.) minor; pallidiore flore.

Amaryllis pallida. *Redouté liliac.* 470.

Bulbus sæpè ovo olorino major, indusiis fibroso-membranaceis, intergerino plexû bombycino-fibroso, ductili. *Folia* plura, angustiùs lorata, fusco-virentia, 7-10-uncialia, vix tres partes unciæ lata, diù tardiora floribus. *Scapus* aphyllus, longior foliis, sæpiùs purpurascens, compressus, solidus. *Spatha* duplo longior *pedunculis* coloratis, cum *germine* concolori clavato-continuis. *Flores* triunciales ultràve, fragrantes, albido-rosei. *Corollæ* laciniis oblongo-lanceolatis deorsùm attenuatis longiùs imbricatis basi

tantùm concretis, exterioribus latioribus margine omninò liberis. *Filamenta* fasciculata, declinata, $\frac{1}{3}$ parte breviora corollâ, inæqualia: *antheræ* vibratæ. *Stigmata* lobuli breves intensè rosei. *Semina* pauca, magna, subglobosa.

Patria: India Occidentalis, docente Hort. Kew. Nonne potiùs Caput Bonæ Spei? Certò inde β.

30. *vittata.* A. corolla cucullato-campanulata; laciniis externis usque ad basin liberis, internis margine pro tertiâ ferè parte adnatis costæ intùs prominenti externarum.

Amaryllis vittata, *Hort. Kew.* 1. 418. *ed.* 2. 2. 225. *Curt. magaz.* 129. *Willd. sp. pl.* 2. 55. *Schneevoogt ic.* 14. *Redouté liliac.* 10.

Bulbus subrotundus, radiculis crassis carnosis. *Folia* 6—7 ultràve, erecto-recurvanda, lorata, breviora scapo, 1—2-uncias lata, obtusiuscula, medio canaliculata. *Scapus* (nunc bini) cylindricus, fistulosus, glaucus, 2—3-pedalis, duplo crassior pollice. *Flores* speciosi, plures ad plurimos, odoratissimi, pedicellati, horizontali-nutantes; *pedicelli* duplo breviores flore magìsve, fistulosi. *Corolla* 3—4-uncialis albida intùs vittis roseis picta, infernè versùs in cucullum longum angustum obsoletè trigonum sensim attenuata; limbus patens recurvatus, ferè regularis, subæqualis: laciniæ lanceolatæ, crispæ, infrà angustatæ, extimæ parùm latiores, uncinato—mucronatæ. *Filamenta* inserta puncto ubi ungues laciniarum intùs cæperunt cohærere in tubum, declinata, subæqualia, fasciculata, unâ quartâ parte breviora limbo. *Germen* obtusè trigonum, oblongum: *stigmata* replicata, intùs canaliculata. *Caps.* oblato-globosa, obsoletè trilobo lobis obsoletis: *Semina* numerosa, cumulata, foliaceo-compressa, nigra.

Patria incerta. Creditur venire Capite Bonæ Spei.

31. *purpurea.* A. limbo erecto rotato-turbinato, subobliquato, tubo æquante faucem membranâ conferruminato-duplicatam: staminibus erectis, incurvo-patentibus.

Amaryllis purpurea. *Hort. Kew.* 1. 417. *ed.* 2. 2. 242. *Willd. sp. pl.* 2. 53. *Nobis in Curt. magaz.* 1430.

Amaryllis elata. *Jacq. hort. schoenb.* 1. 32. *t.* 62.
Amaryllis speciosa. *L'Heritier sert. angl.* 12.
Crinum speciosum. *Linn. fil. suppl.* 195. *Thunb. prod.* 59.
α. major; coccineo-rubens, fauce hyalinâ; antheris longioribus.
β. minor; cerasino-rubens, fauce opacâ; antheris brevioribus.

Bulbus oblongo-ovatus, fuscus. *Folia* interiora altiora, subæquantia *scapum* compresso-cylindricum 2—3-pedalem. *Spatha* longior *pedunculis* 2—3-plo brevioribus flore. *Corolla* sanguineo-punicea, triuncialis, erecta, infundibuliformis: *tubus* rotundatè trigonus; *faux* latè turbinata, per membranam interstitiis laciniarum obsoletè sexdentatam connato-duplicata; *limbus* obsoletè irregularis, huic subæqualis, *laciniæ* reticulato-rugosulæ, extimæ rhombeo-ovatæ acutulæ, intimæ ovali-lanceolatæ ⅓ parte angustiores. *Filamenta* inclusa, alternè subbreviora: *antheræ* verticalitèr appensæ, versatiles. *Stylus* inclinatus, incurvus; *stigmata* obsoletè trina. *Germen* oblongum viride. *Semina* paleaceo-complanata, nigra.

Patria: Caput Bonæ Spei.

32. *coranica.* A. numerosiflora; foliis alternè utroque versùs falcato-obliquatis; scapo plano; corollis regularibus, tubo bis breviore limbo revoluto: staminibus erecto-patentibus.

Amaryllis coranica. *Nobis in Botanical Register* 139; *cum ic.*

Bulbus diametro modò 9-unciali, membranis innumeris in crassam corticem conferruminatis involutus. *Folia* lorata, 6—12, sesuncialia ad bipedalia, latiora sesquiunciam transversa, glauca, serrulato-ciliata. *Scapus* planus, anceps, glaucus, inclinatus, duplo longior umbellâ. *Flores* 20—40, convexiùs umbellati, successivis vesperis expandentes, odorati, purpureo-pallescentes; *pedicelli* teretes, bis breviores corollâ, neque ac in proximâ Brunsvigiā *falcatâ* cum fructû clavato-elongandi. *Germen* polyspermum. *Corollæ* tubus subuncialis; limbus eodem duplo longior, turbinato-campanulatus, revolutus, laci-

niis lineari-lanceolatis subæqualibus. *Stamina* ¼ parte breviora limbo: *antheræ* lunulatæ, vibratæ. *Stigma* punctum obtusum.

Patria: Africa Australis, in agro gentis Coranensis.

VI. *Hexapetalo-partitæ: subrotatæ. Folia bifaria.*

33. *aurea.* A. floribus pedicellatis erectiusculis, corollis infundibuliformi-clavatis, laciniis lineari-lanceolatis, genitalibus rectis, foliis linearibus erectis canaliculatis margine reflexo glabro. *Hort. Kew.* 1. 419.

Amaryllis aurea. *L'Heritier sert. angl.* 14. *Curt. magaz.* 409. *Jacq. hort. schoenb.* 1. 38. *t.* 73. *Willd. sp. pl.* 2. 57. *Redouté liliac.* 61. *Hort. Kew. ed.* 2. 2. 227.

Bulbus subrotundus. *Folia* plura, lorata, canaliculata, acuta, infernè involuta, sesquipedalia, vix unciam lata, erecta. *Scapus* subbipedalis, compressiusculus, pollicem crassus. *Spatha* fusca, lanceolata, sphacelata, plurimùm longior pedicellis, 5—10-flora. *Pedicelli* inæquales longiores unciales. *Corolla* lutea, triuncialis v. magìs, infundibuliformis, anticè subventricosa: *tubus* trigonus, vix semuncialis, virens; *laciniæ* angustæ, lingulato-lanceolatæ, suprà reflexæ et subundulatæ, nervo medio dorsali virentes. *Filamenta* laxiùs fasciculata, subinclinata, alterna subexserta, alterna subinclusa. *Antheræ* lineari-oblongæ, erectæ. *Germen* ovale, obtusè trigonum. *Stylus* curvaturâ leni inclinatus; *stigmata* 3 rubra in unum coarctata. *Decerptìm ex Horto Kewensi et Jacquino.*

Patria: China.

34. *curvifolia.* A. multiflora; foliis angustè loratis subinvolutis glaucis a margine altero subfalcato-curvatis; laciniis lineari-lanceolatis undulatis de medio revoluto-rotatis; staminibus erectis, subexsertis.

Amaryllis curvifolia. *Jacq. hort. schoenb.* 1. 33. *t.* 64. *Willd. sp. pl.* 2. 59. *Redouté liliac.* 274. *Hort. Kew. ed.* 2. 2. 228.

Amaryllis Fothergillia. *Andrews's reposit.* 163.

Amaryllis humilis. *β. nob. in Curt. magaz.* 1089. *Hort. Kew. ed.* 2. 2. 229; *(non quoad varietatem α.)*

Amaryllis corusca. *Nob. in Curt. magaz.* 1430; *in notâ versi folii.*

α. floribus coccineis.

β. floribus miniatis.

Bulbus subrotundus. *Folia* plura, firmula, erecto-patentia, subtus convexula, parùm attenuata, obtusa, pedalia, semunciam lata *v.* latiora. *Scapus* calamo majore crassior, compressiusculus, sesquipedalis ultràve, glaucus. *Flores* suboctoni *v.* plures, inodori sæpiùs plures ac in *sarniensi, pedunculis* rectis biuncialibus. *Spatha* lanceolata reflexa. *Corolla* sesquiunciam alta, coccinea *v.* miniata micans, ad medium usque subconnivens, indè revolutìm stellata. *Filamenta* ruberrima fasciculata, alternè breviora: *antheræ* incumbentes. *Germen* intensè viride, turbinato-sphæricum. *Semina* 1-2, bulboso-laxata, viridia, subrotunda.

Patria: Caput Bonæ Spei.

35. *sarniensis.* A. pluriflora; foliis pluribus angustè loratis subinvolutis, non glaucis, rectis.

α. foliis tardioribus scapo aphyllo.

Amaryllis sarniensis. *Linn. sp. pl.* 1. 421. *Thunb. jap.* 131. *L'Heritier sert. angl.* 15. *Hort. Kew.* 1. 420. *ed.* 2. 2. 227. *Willd. sp. pl.* 2. 59, *Curt. magaz.* 298. *Redouté liliac.* 33.

Amaryllis dubia. *Houttuyn nat. hist.* 12. 181. *t.* 82. *fig.* 1.

Narcissus japonicus rutilo flore. *Cornuti canadens.* 157, *t.* 158. *Ehret pict. t.* 9. *fig.* 3.

Lilium sarniense. *Douglas monogr. t.* 1. 2.

β. foliis floribusque isocronis; corolla roseo-rubente. *Nob. Jacq. hort. schoenb.* 1. 34. *t.* 66. *Willd. sp. pl.* 2. 59. *Hort. Kew. ed.* 2. 2. 228.

γ. floribus coccineis foliorum isocronis.

Amaryllis venusta. *Nobis in Curt. magaz.* 1090.

Bulbus ovatus. *Folia* 5 *v.* circà, angustiùs lorata, obtusa, obsoletiùs involuto-concava, sesquipedalia, semunciam

lata. *Scapus* compressus, altitudine foliorum. *Flores* subseni *v.* plures, *pedunculis* sesquiuncialibus. *Corolla* solo disco incrassato connexa, revoluto-rotata, suprà undulata, sesquiunciam profunda, micans. *Filamenta,* disco medio corollæ connato-defixa, subexserta, rubra; *antheræ* violaceæ, vibratæ, polline luteo. *Stylus* ruber. *Stigmata* replicata, vel coadunata.

Patria : α. Japonia. β. γ. Caput Bonæ Spei.

36. *radiata.* A. multiflora; laciniis 5 vel omnibus in radium semicircularem assurgentibus, undulatis; staminibus deflexis, duplo longioribus corollâ.

Amaryllis radiata. *L'Heritier sert. angl.* 16. *Hort. Kew.* 1. 421. *ed.* 2. 2. 228. *Willd. sp. pl.* 2. 60. *Andrews's reposit.* 95.

Lilio-Narcissus V. *Seligm. aves. t.* 35.

Yuck-lan. *Chinensibus. Roxb. MSS. ined. cum tab.*

Bulbus rotundus. *Folia* plura, ligulata, obtusula, semunciam *v.* circitèr lata. *Spatha* 2-valvis 4—8-flora. *Scapus* teres, 1—2-pedalis, calamum crassus. *Umbella* brevè pedicellata, divaricata, coccinea, magnitudine ferè *sarniensis. Corolla* æqualis, subunilabiato-rotata, laciniis lineari-oblongis, ex utrinque summam mediam versùs obliquatis vel nunc infimâ sub stylo per se stante, acuminatis, revolutis, basi glandulosâ invicèm connexis, uncialibus vel magìs. *Antheræ* parvæ, incumbentes. *Stigma* parvum.

Patria : China : Japonia, affirmante specimine nativo in Herbario Dom. A. B. Lambert videndo.

37. *undulata.* A. laxiùs multiflora; foliis paucis, lorato-linearibus; corollâ recurvo-stellatâ, irregulari, laciniis obversèlinearibus canaliculatis, crispis, imâ staminibus deflexis subtensâ.

Amaryllis undulata. *Syst. Veg. ed.* 13. 264. *L'Heritier sert. angl.* 16. *Hort. Kew.* 1. 420. *ed.* 2. 2. 228. *Jacq. hort. vindob. Curt. magaz.* 369. *Willd. sp. pl.* 2. 60. *Meerburgh ic.* 1. *t.* 13. *J. Fr. Miller ic.* 8. *Redouté liliac.* 115.

Bulbus ovo columbino minor, indusiis fibroso-membranosis, albicantibus. *Folia* 2 lineas circitèr lata, involuto-canaliculata. *Flores* 12 *v.* plures, *pedunculis* subflexilibus breviores, inodori. *Corolla* roseo-rubescens, laciniis mucronatis divaricatis, imâ subremotiore. *Filamenta* fasciculata, rosea, inæqualia, longiora ex unâ quartâ parte breviora corollâ. *Scapus* modò sesquipede longior, parùm crassior pennâ corvinâ. *Germen* oblato-globosum, torosum. *Semina* bulboso-laxata, viridia, è capsulâ tenui præcociùs prorumpentia.

Patria: Caput Bonæ Spei.

38. *humilis.* A. multiflora; foliis paucis ligulatis canaliculatis limbi laciniis sursùm unilabiato-obliquatis: staminibus declinatis brevioribus corollâ.

Amaryllis humilis. *Jacq. hort. schoenb.* 1. 36. *t.* 69. *Willd. sp. pl.* 60. *Nobis in Curt. magaz.* 726. *Redouté liliac.* 449.

Bulbus indusiis fibroso-membranaceis, plexû intergerino fibrarum bombycino atque ductili. *Folia* obtusa, vix tertiam partem unciæ lata. *Scapus* modò bipedalis teres, virens, non duplo pennâ corvinâ crassior. *Flores* inodori, duplo majores A. *undulatæ,* pedicellis divaricatis filiformibus longioribus spathâ. *Corolla* divaricata, rosea, recurvo-stellata, irregularis laciniis ligulatis deorsùm attenuatis undulatis acutis, infrà divaricatis, utrinque summam mediam versùs assurgentibus, margine reflexo. *Germen* virens, oblato-sphæroideum, subtrilobo-torosum. *Filamenta* fasciculata, rubra; *antheræ* violaceæ, vibratæ. *Stigmata* replicata. *Capsulæ* loculi 2—4-spermi: *semina* bulboso-laxata, virentia.

Patria: Caput Bonæ Spei.

39. *flexuosa.* A. pauciflora; foliis loratis angustis obtusulis minutè pustuloso-punctatis; limbi laciniis recurvo-divaricatis undulatis, unâ fasciculo declinato staminum subtensâ, remotâ.

Amaryllis flexuosa. *Jacq. hort. schoenb.* 1. 35. *t.* 67. *Willd.*

sp. pl. 2. 60. *Hort. Kew. ed.* 2. 2. 229. *Nobis in Botanical Register.* 2. 172; *cum ic.*

Undulata minor multiflora; *humilis* major pluriflora; *flexuosa* maxima pauciflora; cæterum inter se persimiles. Hujus *folia* modò pedalia, semunciam lata, subtùs pallentia et conspicuiùs pustulata. *Scapus* bipedalis modò calamum crassus. *Umbella* laxa, *pedunculis* strictis fragilibus, longioribus *spathâ* subroseâ lanceolatâ sphacelatâ. *Corolla* rosea, laciniis tantùm ex disco incrassato connexis, cæterum distantibus. *Stigmata* 3, replicata, rubra, puberula. *Germen* loculis suboctospermis. *Capsula* bulbisperma

Patria: Caput Bonæ Spei.

VII. *Bulbisperma constanter? Vix? Folià multifaria.*

40. *longifolia.* A. umbella suberecto-multiflora, brevè et obesè pedicellata; foliis lorato attenuatis glaucis; tubo subduplo longiore limbo.

Amaryllis longifolia. *L'Heritier sert. angl.* 13. *Hort Kew.* 1. 419. *ed.* 2. 2. 227. *Jacq. ic. rar.* 2. 364. *Ejusd. fragm.* 3. *t.* 2. *f.* 1; *quoad fructum. Willd. sp. pl.* 2. 56. *Nobis in Curt. magaz.* 661. *Redouté liliac.* 347; (*undique excluso Linnæo cum synonymis suis* BRUNSVIGIAM falcatam *intelligentibus*).

Amaryllis bulbisperma. *Burm. prod.* 9.

Amaryllis capensis. *Mill. dict. ed.* 8. *n.* 12.

Folia multifariàm recurvanda, basi invicèm involuto-complexa, scapo longiora, interiora canaliculata. *Scapus* sesqui-bipedalis, subcylindricus, solidus. *Flores* 6-8, sesunciales v. ultrà, roseo-rubentes, indè exalbescentes, odori. *Germen* ellipticum, 3-sulcum, toroso-trilobum, virens. *Corollæ tubus* trisulcus, rotundatè trigonus, pedunculum referens, nunc curvulus; *limbus* subsemiringens, duplo brevior *tubo*, turbinato-campanulatus; laciniis ovali-oblongis, obtusis. *Stamina* inclinata, subæqulia, parùm breviora limbo: *antheræ* vibratæ, vacuæ lunatæ. *Stigma* depresso-subcapitatum. *Capsula* bulbisperma.

Patria: Caput Bonæ Spei.

41. *revoluta.* A. pluri-multiflora; foliis lorato-acuminatis glauciusculis, floribus erecto-recurvulis, pedicellatis, cucullatis; limbo patulo revoluto obsoletè irregulari, duplo longiore tubo.

Amaryllis revoluta. *L'Heritier sert. angl.* 4. *Hort. Kew.* 1. 419. *ed.* 2. 2. 227. *Willd. sp. pl.* 2. 57. *Nob. in Curt. Magaz.* 915. *cum tab.* 917; *in notâ.* 1178, *cum tab. exemplario vegetiore desumptâ.*

Amaryllis variabilis. *Jacq. hort. schoenb.* 4. *t.* 428.

Folia ad 12 usque, in orbem recurvanda, interiora gradatìm angustiora acutiùs canaliculata, exteriora involuta, modò bipedalia, 2 uncias lata. *Scapo* his altior, compresso-cylindricus. *Spatha* longior *pedicellis.* *Flores* suaveolentes triunciales magìsve. *Germen* breve ellipticum, exsulcum læve. *Corolla* tubuloso-infundibuliformis, intùs albida, extùs tubo et secundùm medium laciniarum suffuso roseo et viriditate varia: *tubus* linearis rotundato-angulosus, virescens, flexus; *faux* cucullata profunda, *laminæ laciniarum* revoluto-patulæ, intimæ sublatiores. *Filamenta* declinata, parùm inæqualia. *Stylus* corollæ subæqualis; *stigmate* parvulo, orbiculato aperto. *Semina* solitaria in loculis, cavitati conformia.

Patria: Caput Bonæ Spei.

42. *zeylanica.* A. (sessiliflora) foliis plurimis lorato-lanceolatis undulatis, medio crassis, margine lævi; corollis obsoletè bilabiatis, limbo tubo; subæquali cernuo.

Amaryllis zeylanica. *Linn. sp. pl. ed.* 2. 1. 421. *L'Heritier sert. angl.* 13. *Willd. sp. pl.* 2. 56.

Amaryllis ornata. *nob. in Curt. Mag.* 1171. *Hort. Kew. ed.* 2. 2. 226.

Crinum latifolium. *Andrews's reposit.* 390.

Crinum zeylanicum. *Linn. sp. pl. ed. Reich.* 2. 24.

L. N. zeylanicus. *Comm. hort. amst.* 1. 73. *t.* 73. *Rudb. elys.* 2. 191. *f.* 2.

Tulipa Javana. *Rumph. amb.* 5. 306. *t.* 105.

Folia exteriora in orbem recumbentia, sedecim usque *v.*

ultra, modò tripedalia, latitudine triuncialia, concaviuscula, striata. *Scapus* modò 3-pedalis, purpurascens: *Umbella* pluri-multiflora. *Flores* magni, purpureo-albicantes, odoratissimi. *Tubus* subtriuncialis erectus rotundato-trigonus, intensè purpureus, stipitem *v.* pedunculum crassum referens: limbus vix brevior, subbilabiato-campanulatus, reflexus, laciniis oblongo-lanceolatis, recurvis apice, summâ mediâ porrecto-depressâ. *Stamina* declinata, tertiâ ferè parte breviora limbo. *Stigmata* 3 brevia, in *stylo* gracillimo. *Semina* bulboso-laxata, sæpiùs unicum.
Patria: India Orientalis. Ceylon.

43. *ornata.* A. (sessiliflora) foliis plurimis lorato-attenuatis, canaliculatis, margine scabro; limbo obsoletè bilabiato, breviore tubo subnutante.

Amaryllis ornata. *Hort. Kew.* 1. 418. *Willd. sp. pl.* 2. 55. (α) *Nobis in Curt. Mag.* 1253. (β) *Hort. Kew. ed.* 2. 2. 226.

A. Broussonetii. *Redouté liliac.* 62.

A. spectabilis. *Andrews's reposit.* 390.

A. yuccæides. *Thompson's bot. displ. t.* 12.

Crinum yuccæflorum. *Salisbury paradis.* 52.

Lilio-Narcissus africanus, &c. &c. *Ehret pict. t.* 5. *f.* 2. *Trew Ehret. t.* 13.

α.) uniflora; scapo purpureo; foliis angustis acutè canaliculatis.

β.) pluriflora; scapo virente; foliis non undulatis; limbo corollæ staminibusque erectiusculis.

γ.) pluri-multiflora; scapo viridi; foliis undulatis; limbo nutante.

Hanc olim cum Dryandro habuimus pro varietate antecedentis. At certè distincta. Ipsa forsan dividenda?

Patria: Guinea, Sierra Leone, Capo Corso (Anglis depravatè Cape-Coast.) β. *Senegal.*

44. *gigantea.* A. (sessiliflora) foliis plurimis oblongo-lanceolatis, utrinque angustatis, undulatis, sulcato-striatis, margine scabro; limbo nutante, obsoletè bilabiato, breviore tubo.

Amaryllis gigantea. *Hort. Kew. ed.* 2. 2. 226.

Amaryllis ornata. β. *Nobis in Curt. Magaz.* 923.*

Amaryllis Jagus. *Thompson's bot. displ. t.* 6.

Crinum giganteum. *Andrews's reposit.* 169. *Redouté liliac.* 181.

Bulbus ovatus, nunc æquans caput infantis. *Folia* nunc tripedalia, exteriora latiora recumbentia, lato-oblonga. *Scapus* subtripedalis. *Umbella* sub-7-flora diffusa. *Flores* 7—8-unciales *v.* ultià, albi, odorati. *Corolla* subhypocrateriformi-campanulata, *tubo* virente crassè pedunculoideo, abruptiùs transeunte in *limbum* patentissimum; laciniis unciam latis, elliptico-lanceolatis, summâ antrorsùm depressâ. *Semen* solitarium, maximum, bulboso-laxatum.

Patria: Sierra Leone.

45. *latifolia.* A. spatha multiflora, floribus pedicellatis basi tubulosis, foliis oblongo-lanceolatis. *L'Heritier sert. angl.* 14.

Amaryllis latifolia. *Willd. sp. pl.* 2. 57.

Crinum latifolium. *Linn. sp. pl.* 1. 419.

Sjovanna-pola-tali. *Rheede malab.* 11. 77. *t.* 39. *Rudb. elys.* 2. 91. *fig.* 12.

Folia costâ crassâ, margine scabro. *Scapus* plano-compressus, 3-pedalis. *Flores* 5—6, candidi, subodorati, 4—5-pollicares; laciniis pollicem latis. *Stamina* purpurea: *antheræ* flavæ. *Rheede.*

Patria: India Orientalis.

VIII. *Germen loculamentis dispermis. Folia petiolata.*

46. *hyacinthina.* A. umbella subsessili; foliorum lamina varicoso-nervosa; corollæ laciniis 2 summis lateralibus arrectis collaterali-conniventibus: stamine summo remoto accumbente.

Amaryllis hyacinthina. *Nobis in Botanical Register.* 163; *cum ic.*

Bulbus ovatus. *Folia* 2—3, Hemerocallidis *cæruleæ* subsimilia, bifaria?, inflorescentiâ diù tardiora, ovato-

oblonga acumine abrupto, plana, nervosa atque lineolis transversis cancellata, saturatè viridia costâ mediâ crassâ carinata 8-uncialia, uncias tres lata: *petioli* crassi, plano-convexi, 3-plo breviores. *Scapus* longior foliis, cylindricus. *Spatha* multò brevior floribus. *Flores* 9—10, erecto-nutantes, uncias 2 cum dimidio longi, albo et hyacinthino varii, inodori. *Corolla* infundibuliformis, ringens, inæqualis; *tubus* violaceo-pallidus, pluriès brevior limbo, antrorsùm flexus, cylindricus, cum nervo postico subvaricoso: *limbus* de *fauce* brevi nudâ et subtùs gibbosâ semiradiato-dispansus, *laciniæ* lanceolatæ, subundulatæ, exteriores 3 et interiorum ima media angustiores consimiles violaceo-pallentes: *labii summi* tres arrecto-convergentes, harum laterales latiores firmiores planiores intensè hyacinthinæ, disco maculâ albâ elongato-oblongâ pictæ; *labii infimi* 3 stellatæ, harum laterales apice revolutæ, media deflexa. *Stamina* $\frac{1}{3}$ parte breviora limbo, declinata, albicantia; summum arrectum reflexum, distans. *Antheræ* breves, oblongæ, pallidæ. *Stigma* punctum simplex. *Germen* subglobosum, subcoloratum, *loculamentis* collaterali-dispermis: *ovula* erecta oblonga, fundo affixa, ferè ac in PANCRATIO *amboinensi* et nonnullis aliis ejusdem generis.

Patria: Brasilia.

Loci sortiendi reliquis non suprà recensitis speciebus, sub AMARYLLIDE in "*Speciebus Plantarum Willdenovii*" obviis.

No. vol. pag.

8. clavata. *v.* 2. *p.* 52; est Cyrtanthus angustifolius. *nob. in Botanical Register. v.* 2. 168.

12. linearis *v.* 2. *p.* 53. *Ob adumbrationem imperfectam incerta.*

15. tatarica. *v.* 2. *p.* 54. ALSTRŒMERIÆ *species? Vix? Potiùs cum* montanâ, *cujus congener certus, genus condentes novum. Flores non umbellati; capsula elongato-oblonga, nervis* 12 *prominentibus striata. Laciniæ corollæ medio trinerves. Planta caulescens, non scaposa. Specimen vidimus archetypum in Herbario Dom. A. B. Lambert.*

18. falcata. *v.* 2. *p.* 55; *est* BRUNSVIGIA falcata. *nob. in Curt. Magaz.* 1443.

21. montana. *v.* 2. *p.* 56; *congener* tataricæ; *si non altera eadem. Specimen archetypum Labillardieri in Herb. Dom. A. B. Lambert.*

26. orientalis. *v.* 2. *p.* 58; *est* BRUNSVIGIA multiflora. *Hort. Kew. ed.* 2. 2. 230.

28. marginata. *v.* 2. p. 59; *est* BRUNSVIGIA marginata. *nob. in Curt. Magaz.* 1443; *folio altero, verso.*

34. Radula. *v.* 2. *p.* 61; *est* BRUNSVIGIA Radula. *nob. loc. cit.*

35. striata. *v.* 2. *p.* 61; *est* BRUNSVIGIA striata. *nob. loc. cit.*

36. crispa. v. 2. *p.* 61; *est* STRUMARIA crispa. *nob. loc. cit.* 1363.

37. stellaris. *v.* 2. *p.* 61; *est* STRUMARIA stellaris. *nob. loc. cit.*

38. caspia. *v.* 2. *p.* 62; *est* ALLII *species*; *affirmante archetypo Pallasiano in Herb. Dom. A. B. Lambert.*

Affinitates generis.

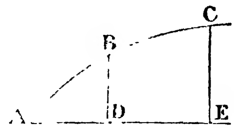
Accedit NARCISSO, ex *luteâ*; STRUMARIÆ, ex *chloroleucâ*; PANCRATIO, ex *purpureâ*, et ad alia diversa puncta, ex speciebus cum tubo coronato; CYRTANTHO, ex *vittatâ*; BRUNSVIGIÆ, hìnc ex *coranicâ*, indè ex *flexuosâ*; CRINO, ex speciebus bulbispermis foliis multifariis.

ART. XIV. *Solutions of some Problems by Means of the Calculus of Functions. By* Charles Babbage, *Esq. F. R. S.*

PROB. I.

REQUIRED the nature of a curve ABC such that if any two abscissæ AD and AE be taken whose rectangle is equal to a

given square, then the rectangle of their corresponding ordinates BD and CE shall be equal to another given square



let $AD = x$ and $BD = y = \psi x$, and let the two given squares be a^2 and c^2 then by the problem

$$AD \times AE = a^2 \text{ and } BD \times CE = c^2$$

hence $AE = \frac{a^2}{AD} = \frac{a^2}{x}$ and $CE = \psi\,(AE) = \psi\left(\frac{a^2}{x}\right)$

and the functional equation which results is

$$\psi x \times \psi\left(\frac{a^2}{x}\right) = c^2$$

As this equation is not generally soluble by the direct method which I have proposed, we must endeavour to find some particular solution which may contain an arbitrary constant. If a^2 were equal to c^2 it is evident that the equation would be satisfied by supposing $\psi x = x$ or $\psi x = x^n$. Let us therefore assume $\psi x = Ax^n$

then $$\psi\left(\frac{a^2}{x}\right) = A\left(\frac{a^2}{x}\right)^n$$

and the equation becomes

$$A^2 x^n \left(\frac{a^2}{x}\right)^n = A^2 a^{2n} = c^2$$

hence $$A = c a^{-n}$$

and the solution of the given equation is

$$\psi x = c\left(\frac{x}{a}\right)^n$$

This solution contains the arbitrary constant n which may, as I have shown in* Prob. VIII. be changed into any arbitrary function of x which does not vary when x becomes $\frac{a^2}{x}$; such a function is $\chi\left(\overline{x}, \overline{\frac{a^2}{x}}\right)$ which denotes any symme-

* See an Essay towards the Calculus of Functions in the last Volume of the Philosophical Transactions.

trical function of x, and $\frac{a^2}{x}$ consequently the general solution of the given equation is

$$\psi x = c\left\{\frac{x}{a}\right\}^{\chi\left(x,\overline{\overline{\frac{a^2}{x}}}\right)}$$

hence the equation which comprehends the species of curves which is required, is

$$y = c\left\{\frac{x}{a}\right\}^{\chi\left(x,\overline{\overline{\frac{a^2}{x}}}\right)}$$

when the arbitrary function is equal to a constant quantity, we have the particular solutions already noticed

$$y = c\left(\frac{x}{a}\right)^n$$

and since n may whole or fractional, positive or negative, it follows that all parabolas and hyperbolas of every degree, possess the required property.

The equation $\psi x \,.\, \psi\left(\frac{a^2}{x}\right) = c^2$ may otherwise be solved in the following manner; assume $\psi x = AB^{\varphi^x}$, then the equation becomes

$$Ab^{\varphi x} \times Ab^{\varphi\left(\frac{a^2}{x}\right)} = c^2$$

which will be satisfied if $A = a$ and $\varphi x = -\varphi\left(\frac{a^2}{x}\right)$ we must therefore endeavour to discover a particular solution of $\varphi x = -\varphi\left(\frac{a^2}{x}\right)$, the first which presents itself is $\varphi x = x - \frac{a^2}{x}$ this being substituted gives

$$\psi x = cb^{x-\frac{a^2}{x}}$$

and since b is arbitrary it may be changed into any arbitrary function which does not vary when x is changed into $\frac{a^2}{x}$, hence the general solution is

$$\psi x = c\left\{\chi\left(x,\overline{\overline{\frac{a^2}{x}}}\right)\right\}^{x-\frac{a^2}{x}}$$

This solution suggests a similar one of the more general problem when AE is equal to any given function α of AD, provided $\alpha^2 x = x$, in this case we have $AD = x$ $AE = \alpha x$ and the equation to he satisfied is

$$\psi x \, . \, \psi \alpha x \, . \, x = c^2$$

put $\psi x = cb^{\varphi x}$ then it becomes

$$cb^{\varphi x} \times cb^{\varphi \alpha x} = c^2$$

which will be fulfilled if $\varphi x = - \varphi \alpha x$,
a particular solution of this equation is $\varphi x = x - \alpha x$,
for then $\varphi \alpha x = \alpha x - \alpha^2 x = \alpha x - x$
hence the general solution of $\psi x \, . \, \psi \alpha x = c^2$ when $\alpha^2 x = x$ is

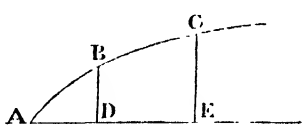
$$\psi x = c \left\{ \chi (\overline{x}, \overline{\alpha x}) \right\}^{x - \alpha x}$$

A similar solution is also applicable to the same equation when $\alpha^{2n} x = x$ in that case it is

$$\psi x = c \left\{ \chi (\overline{x}, \overline{\alpha x}, \overline{\alpha^2 x}, \ldots \overline{\alpha x^{2n-1}}) \right\}^{x - \alpha x + \&c. - \alpha^{2n-1} x}$$

PROB. II.

Required the nature of a curve ABC such that supposing AD any abscissa, if we take another abscissa AE having any given relation to the former, then the ordinate CE corresponding to the second abscissa shall have the same given relation to the ordinate BD corresponding to the first abscissa



Let the first abscissa AD be denoted by x, and let the relation of the second abscissa $AE = x'$ to it be expressed by αx, α being some given function, then if $BD = y = \psi x$ we have $CE = y' = \psi \alpha x$, and by the conditions of the Problem

$$\alpha \psi x = \psi \alpha x$$

this equation will evidently be satisfied if $\psi = \alpha$ or more generally if $\psi = \alpha^n$, for it then becomes

$$\alpha \alpha^n x = \alpha^n \alpha x$$

which is identical.

If it should happen that for some particular value of n we find $\alpha^n x = x$, then the solution $\psi x = \alpha^n x$ admits of only $p - 1$ values, p being the least value of n which satisfies the equation $\alpha^p x = x$.

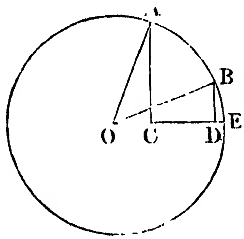
Suppose it were required that the sum of the squares of the two abscissæ should be equal to a constant quantity, then the sum of the squares of the corresponding ordinates must be equal to the same quantity, and the equation becomes

$$\psi(\sqrt{a^2 - x^2}) = \sqrt{a^2 - (\psi x)^2}$$

and the solution corresponding to $\psi x = \alpha x$ is

$$y = \psi x = \sqrt{a^2 - x^2}$$

which is the equation to a circle, the abscissæ beginning at the centre and having for its radius the quantity a



In fact, if in any circle OABE we take any two abscissæ OC, and OD so related that the sum of their squares shall be equal to the square of the radius OA; it is easy to show that the two triangles OAC and OBD are similar and equal, and consequently that the sum of the squares of the two ordinates AC and BD is also equal to the square of the radius: in the case just examined, we find $\alpha^2 x c = x$, consequently we cannot from this method deduce any other solution.

The solution of the equation $\psi \alpha x = \alpha \psi x$ may be rendered more general, when $\alpha^n x = x$ by the following means, since it is satisfied by supposing $\psi x = \alpha^p x$ whatever may be the value of p, for p substitute any symmetrical function of $x, \alpha x, \ldots \alpha^{n-1} x$, and the general solution is

$$\psi x = \alpha^{\chi(\overline{x}, \overline{\alpha x} \ldots \overline{\alpha^{n-1} x})} x$$

PROB. III.

What is the relation between x and y such that if

$$x = a + by + cy^2, + \&c.$$

we may by reverting the series have

$$y = a + bx + cx^2 + , \&c.$$

Let $x = \psi y$ then by the condition of the Problem we have also $y = \psi x$, hence $x = \psi y = \psi\psi x = \psi^2 x$, and the nature of the function ψ is determined from the equation

$$\psi^2 x = x$$

the solution of this equation is already known,* and any of the various values of ψx will when expanded, produce a series of the required form, such for example are

$$x = \psi y = \sqrt{1 - y^2} \text{ or } x = \frac{a - by}{b + cy}$$

In fact, if from any symmetrical function of x and y we find the value of x expressed in terms of y, it is clear that y might be expressed in terms of x in precisely a similar manner, and this is nothing else than a different mode of denoting the general solution of the equation $\psi^2 x = x$.

PROB. IV.

What operation must be performed on x so that if we repeat the same operation on the result, and on this result again repeat the same operation, and so on, after performing it four times, the last result may be equal to the original quantity.

Let the operation to be performed be denoted by the characteristic ψ, then the first result is ψx, and repeating the same operation four times, we have

$$\psi\psi\psi\psi\, x = \psi^4 x$$

and by the condition of the Problem this must be equal to the original quantity; hence

$$\psi^4 x = x$$

In order to solve this equation, let us suppose $\psi x = \overset{-1}{\phi} f \phi x$, $\overset{-1}{\phi}$ signifying the inverse operation of ϕ then $\psi\psi x =$

* See Prob. IX. of an Essay towards the Calculus of Functions in the Philosophical Transactions for the year 1815.

$\varphi^{-1} f\varphi\varphi^{-1} f\varphi x = \varphi^{-1} f^2 \varphi x$ and we shall find $\psi^3 x = \varphi^{-1} f\varphi\varphi^{-1} f^2 \varphi x = \varphi^{-1} f^3 \varphi x$ and $\psi^4 x = \varphi^{-1} f\varphi\varphi^{-1} f^3 \varphi x = \varphi^{-1} f^4 \varphi x$ from which substitution the equation becomes

$$\varphi^{-1} f^4 \varphi x = x$$

and performing the operation indicated by ψ on both sides we have

$$f^4 \varphi x = \varphi x$$

this equation will be identical if we assume such a value for f, that $f^4 y = y$, that is, we must make f a particular solution of the given equation.

A particular solution of the more general equation may be found from the following curious property of the function $\dfrac{a + bx}{c + dx}$, if this function be called fx, then will its n^{th} function or $f^n x$ always be of the same form, or $f^n x = \dfrac{A + Bx}{C + Dx}$ when A, B, C, and D, are given functions of a, b, c, and d: and these latter quantities may always be so assumed that $A = o$, $B = C$ and $D = o$.

By employing this property, we have in the present instance as a particular solution of $f^4 x = x$,

$$fx = \frac{a + bx}{c - \dfrac{b^2 + c^2}{2a} x}$$

and by substituting this value of f we have for the general solution of the equation $\psi^4 x = x$

$$\psi x = \varphi^{-1} \left\{ \frac{a + b\varphi x}{c - \dfrac{b^2 + c^2}{2a} \varphi x} \right\}$$

This solution contains an arbitrary function φ, and by assigning various values to it we shall have an indefinite number of particular solutions; a few examples, however, will be sufficient.

Ex. 1. Let $\varphi x = x$ and $a = b = c$, then one particular solution is

this gives $\psi^2 x = -\dfrac{1}{x}$ and $\psi^3 x = -\dfrac{1 - x}{1 + x}$ and $\psi^4 x = x$.

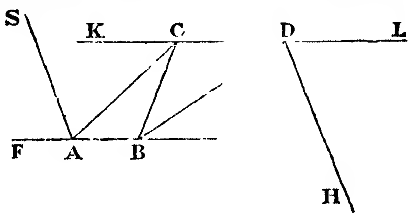
Ex. 2. Let $a = -1$, $b = 1$, and $c = o$, also $\varphi x = x$ then $\psi x = 2\dfrac{x-1}{x}$ which is another solution, for $\psi^2 x = \dfrac{x-2}{x-1}$, $\psi^3 x = -\dfrac{2}{x-2}$ and $\psi^4 x = x$.

Ex. 3. a, b, and c remaining the same, let $\varphi x = \epsilon^x$, then $\overset{-1}{\varphi} x = \log x$, and another solution is

$$\psi x = \log(\epsilon^x - 1) - x + \log 2$$

PROB. V.

A ray of light SA falls on a surface AB which reflects it, but not according to the common law of reflexion,



it then impinges on the surface CD which is similarly constituted and parallel to the former; after this it undergoes a second reflexion at the first surface, and also a second reflexion at the other surface.

Now it is found that whatever may be the angle n at which it meets the first plain, that it is always after undergoing the four reflexions parallel to its first direction.

Let the angle SAF which the ray makes with the first surface be θ. and let the angle which the ray makes with that surface, after the first reflexion be denoted by $\psi\theta$: since the two surfaces are parallel, the angle KCA is equal to the angle CAB $= \psi\theta$; and since the surface KL reflects according to the same law as the surface FE, the angle LCB will have the same relation to the angle KCA as the angle CAE has to SAF, therefore LCB $= \psi(\text{KCA}) = \psi\psi\theta = \psi^2\theta$: and in a similar manner it may be shown that DBE $= \psi^3\theta$ and LDH $= \psi^4\theta$, and since by the conditions of the Problem the ray after the last reflexion is parallel to ray before its first incidence we must have

$$\text{LDH} = \text{SAF}$$

which gives

$$\psi^4 \theta = \theta$$

this equation is the same as that of Prob. 5, and one very general solution is

$$\psi\theta = \overset{-1}{\varphi}\left(\frac{a + b\varphi\theta}{c - \frac{b^2 + c^2}{2a}\varphi\theta}\right)$$

φ is arbitrary, and this formula contains an infinite variety of relations between the angle of incidence and that of reflexion, any of which taking place will cause the last ray to be parallel to the first.

It seems probable that this solution, although a very extensive one, does not contain all the possible answers, and if we have regard to the utmost generality, the solution must be deduced from that of the equation

$$F\left\{\overline{\theta}, \overline{\psi\theta}, \overline{\psi^2\theta}, \overline{\psi^3\theta}\right\} = o$$

If we suppose the ray to be parallel to itself after two reflexions the equation will be

$$\psi^2 \theta = \theta$$

and all the possible solutions of this equation are I believe contained in the value of $\psi\theta$ deduced from the equation

$$F\left\{\overline{\theta}, \overline{\psi\theta}\right\} = o$$

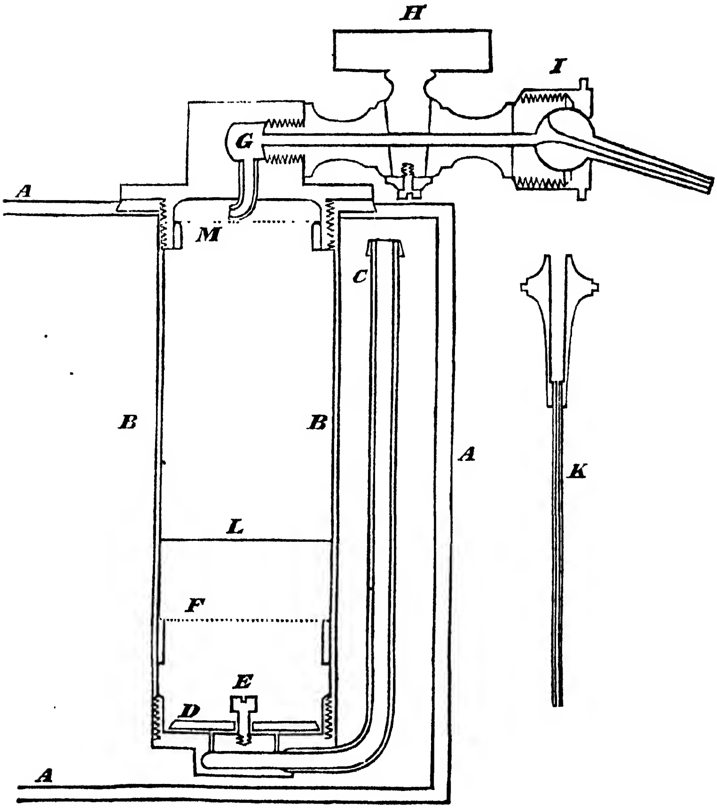
F denoting any symmetrical function whatever.

ART. XV. *An Account of an improved Blow-pipe. In a Letter from Mr.* John Newman, *to the Editor.*

SIR,

In a former Number of your Journal, you inserted for me, an Account of a Blow-pipe, then new to the public. The instrument has since been very generally used, to obtain a high temperature, by the combustion of a mixture of oxygen and hydrogen gases. The mode of rendering this use of the instrument safe, was, by rejecting all jets but such as were of a very fine bore; and, as Sir H. Davy has shewn, that any inflammation of gases may be arrested in its passage, by an aperture sufficiently minute, all danger of the recession of the flame was thus obviated.

A desire, however, to increase the heat, has occasionally led to the use of tubes, through which the flame could pass, and an explosion has consequently happened in the apparatus, to the destruction of the instrument, and the danger of the experimentalist. In order to provide against the recurrence of such events, I have had recourse to a plan suggested by Professor Cumming, of Cambridge, and which I find to be an effectual security against any accidental explosion of the instrument; and I take the liberty of transmitting an account of it to you, that it may be made public in your Journal.



The wood cut annexed, represents a section of the apparatus, and part of the copper box. AAA, is the box for the gases. BB, a piece of brass tube, closed at the bottom, which may be

called the *trough*, is fixed, air tight, into the box. At the upper surface, C is a small tube in the interior, which, commencing near the top, descends to, and is inserted into the bottom of the trough; two or four holes are made from the trough into this tube, and open a communication to the gases in the box; a circular flat valve D, lined with oiled silk or leather, and moveable on a central pin E, covers these holes, and prevents the passage of any thing from the trough into the box. At F, the trough is intersected by a fine wire gauze. The cap of the trough, which screws on air tight, contains a small chamber G, communicating, by a fine tube, with the interior of the trough; and just below the orifice of this tube, is a second piece of very fine wire gauze. The stop-cock B connects the cap with a jet pierced, having a circular motion I; and to this various tubes, as K, may be fitted. A piece of fine wire gauze covers the end of the tube at C, to stop the passage of any thing from the box which may prevent the action of the valve. When the instrument is to be used, the common air should be exhausted from the reservoir, by means of the syringe, and filled with the gases; after which water should be poured into the trough to about L; the gases may then be condensed into the box as formerly, and by their own elastic force, will pass through the tube, the water, and the various screens of wire gauze, and issue out at the jet; but when the inflammation, by the use of a very large jet, or of a slow current through a small one, passes backwards, it is generally arrested by the screen at M; and when it does pass it, it merely explodes the small portion of gas in the upper part of the trough, and does no harm; and the valve D prevents the water from being propelled into the box. In my first essays with the pneumatic trough, I had provided no valve, but then found, that repeated detonations in the trough, gradually forced the water backwards into the box; at present, however, such a circumstance is impossible, unless the valve be out of order, and its simplicity will, I conceive, sufficiently secure its perfect and constant action.

I have frequently tested these blow-pipes, by turning the stream full on, and inflaming it immediately at the stop-cock.

The heat is at first intense; but as the force of the current diminishes, it becomes unable to oppose the progress of the inflammation to the interior of the trough; the gases, therefore, inflame there with a faint sound, and the combustion is extinguished. When the cock is partly turned on, and a lamp is placed before the jet, the whole of the gas may be exploded in the trough by a series of slight detonations, and they are rendered evident by the successive impulses on the flame of the lamp, but produce no further effect.

Whilst the blow-pipe is in the state described, I believe it to be perfectly safe, for I can imagine no possibility of the flame passing into the interior of the box. Experience alone, however, can prove its safety; and as it is possible that some unknown circumstance, or combination of circumstances, may occur, which are not here provided for, I will observe, that I have always made the end farthest from the jet the weakest, and have the satisfaction of knowing, that when the instruments have been burst, (before this preventative was applied,) they have never yielded but at that part; and though at present there may appear no necessity for the same precaution, yet it is my intention constantly to construct them in a similar manner.

I am, Sir,
Your most obedient servant,
JOHN NEWMAN.

Philosophical Instrument maker,
No. 7, Lisle Street, Leicester Square.

ART. XVI. VOYAGE *de Découvertes* AUX TERRES AUSTRALES, *exécuté sur les Corvettes le Géographe, le Naturaliste, et la Goëlette le Casuarina. Rédigé en partie, par feu* F. PERON, *et continué par* M. L. FREYCINET. *Historique, T.* 2. Paris, 1816.

THE second volume of this work has at length appeared. Though it contains some curious and entertaining matter,

it is apparent that more than a fair proportion of the most interesting details and observations was appropriated to the first.

We were, of course, anxious, considering all that has passed, to see what was said, by way of answer, to the charges brought by Captain Flinders against M. Péron. He did not, as we have before observed, live to see the publication of this volume. On his death, he bequeathed his papers to his friend Lesueur: and M. Freycinet was at length appointed by the government to continue the second volume. The author, however, lived to correct the press of the present volume up to p. 231.

M. Freycinet pledged himself to answer the complaints of Captain Flinders, of having been deprived of the merit of a discovery of part of the south-west coast of New Holland. This pledge in the Preface prefixed to the present volume, M. Freycinet has proceeded to redeem. We may be prejudiced, or may have hastily examined the statements, but we cannot consider it in some parts so satisfactory, as M. Freycinet supposes it will be considered; though, inasmuch as it abandons all title to priority in material discoveries originally claimed by the French, it is, of course conclusive. We shall, as nearly as we can, in his own words, give the heads of his arguments.—

"M. Baudin, it seems, was the only person with whom Captain Flinders had any direct communication, and this was merely oral—and the result of this conference, therefore, may have been communicated by M. Baudin to his officers, *with more or less accuracy*.—With respect to Kangaroo Island of Flinders, which, he complains, was changed into Isle Decrés, at Paris, notwithstanding his name was adopted by us during our voyage—it must be observed, though Flinders's sailors might call it Kangaroo Island, because they, like ourselves, found many of these animals there, Péron was well aware that many names given during the course of a voyage, are not always definitively fixed; and it was not till the publication of Flinders's voyage, whereby it would appear what were the exact names fixed, that any thing could be precisely known.—With regard to Spencer and St. Vincent Gulphs, (called by us, Bonaparte and Josephine), their names *could not be known to us*, more especially, as, during Flinders's voyage, they were called by himself *Great and Little Inlet*—a circumstance corroborative of what has been observed

with respect to Kangaroo Island.—Nor, I contend, is the giving names to newly-discovered lands, undescribed in any work, as indicative of an *assumption of the merit of a first discovery*, as insinuated by Captain Flinders, unless ascertained by other circumstances; it cannot be considered more than an avowal of the ignorance of the names imposed by preceding navigators.—Péron certainly was wrong in affirming any thing of Captain Flinders of which he was not certain, and which he, probably, only collected by hearsay, from the boat's crew of Flinders, or rather what the French officers collected, as he did not then speak English—but, although he may have made some mistakes in the statements as to Captain Flinders's route, still, I maintain that, in the whole, he has said enough to shew that Flinders *preceded* us, in part of the coast which we were exploring in concert, for the indication of the *point when the two expeditions met*, *is alone sufficient to do this*; and his only fault appears to have hazarded details, the truth of which he could not be certain.—Besides, I am persuaded that Péron wrote only that which he conceived was the truth; and I can assert, that I always heard him speak on this subject in the same manner as he had written.—But, however, the question is *now set at rest*, by the publication of the two works, which afford, at once, incontrovertible evidence of what was done by each.—Even admitting all that Flinders said to our commander had been accurately represented to Péron, I ask, how could he point out the different places visited by the Investigator, without either charts or writings relating to them?—Besides, I maintain, after all, that Péron has written nothing in opposition to the *priority of Flinders's discoveries*. *Le Géographe* encountered the *Investigator* at a particular point. They were both charged with discoveries in the south-west of New Holland. Le Géographe went from east to west, the Investigator from west to east.—Péron has in effect stated this, and the conclusion is obvious; that portion of unknown coast *west* of the point of meeting, and which was seen by Flinders, belonged to him, as *first discoverer*; that to the *east* of the same point to Baudin.—As to the details, each navigator is entitled to lay them before the public.—With respect to the term "priority of discovery," it leads to the question, How far it is at all applicable to the reconnoitering shores, of the existence of which there was no question; at least in the present case, there could be no *merit* in priority.—Two navigators, at the same time, or nearly so, ignorant of each others proceedings, reconnoitre a coast from one part to the other —the *discovery*, as far as it may be so called, may be considered as being made at the same time—the difficulties and the dangers are

equal, and the true merit consists in the greater or less accuracy and skill exhibited in the survey of the coast. With regard to *chronological* order, there must, of course, be a *priority of discovery*, and this belongs to such as first saw such and such distinct parts of the coast visited—but the first seeing one particular part cannot be considered as giving a priority to the whole.—In the present instance *discovery* was not the object.—The other shores of New Holland were always known: there could be no question of the *existence* of the south-west part.—The object was solely geographical detail.—

I, therefore, come to the following conclusions, as to the priority of discovery of the different parts of the S. W. coast of New Holland, and which I can venture to say, are the same as M. Péron would have agreed to, had he lived, as indeed would every man desirous of doing justice.

1. Flinders *first discovered* the S. W. coast of New Holland, extending from the eastern extremity of Nuyt's Lands, to longitude 138° 58′ E. of Greenwich.

2. M. Baudin *first discovered* the part of the same coast comprised within the before mentioned longitude 138° 58′, and the longitude 140° 15′ E. G.—that is, from Cape *Monge* to Cape *Buffon* of Flinders, inclusive.

3. Captain Grant *first discovered* that part of the same coast extending from Cape Lannes to Port Western.

4. Captain Flinders's voyage from Nuyt's Land to Cape Lannes, being without knowledge of Captain Baudin's operations, is to be considered as *a voyage of discovery*.

5. The voyage of Captain Baudin, from Port Western to Nuyt's Land, being without knowledge of the discoveries of Flinders or Grant, is to *be considered the same*.

6, 7, and 8. The names given by Flinders to the places which he *first* discovered, are to be preferred, except where Baudin, on the same shore, has named places not visited by Flinders. The same rules to apply to the discoveries of Baudin and Grant.

We shall make no remarks on the foregoing observations, but leave the matter at rest.

Besides the details of the voyage, from the 18th November 1802, to the return to Europe 16th August 1804, this volume contains the author's papers on the English South Sea Fisheries; on some phenomena of the zoology of the southern regions, as applicable to the physical history of the globe, and of the human species: the memoirs on the dysentery and the use of betel; and on the habitation of marine animals, by

Péron and Lesueur: a notice on the vegetable productions of New Holland, by M. Leschenault: and a fragment of a memoir on the preservation of zoological specimens by Péron and Lesueur. Most of these have been before published separately. The memoir on the zoological phenomena, we conceive the most interesting, and we shall, at a future period, give the author's general results. For the present, we shall close this notice with an extract relating to zoological geography—a subject to which M. Péron appears to have given considerable attention.—

In the infancy of the study of natural history, and before the adoption of a technical terminology, voyagers and naturalists perpetually confounded, under the same appellation, animals essentially distinct; and there was no class in the animal kingdom which did not include several species, considered as *orbicolar*, that is, indiscriminately inhabiting all parts of the Globe. Other species, though confined to certain latitudes, were considered as common to all the climates and seas comprised in such latitudes, their existence being held to be independent of the longitudes.—Thus, with respect to the, classes of marine animals, we perpetually see it stated, in the works of the most esteemed authors, that the larger whale, (Balæna Mysticetus,) is alike an inhabitant of the seas of Spitzbergen and the South Pole. The sea wolf, sea calf, and sea lions, &c. are made equally to inhabit the most distant seas of the two hemispheres. Reason and analogy alone would render these facts doubtful; experience shews them to be false. Examine the proofs of these pretended identities, and it will be found, that they exist only in their names, and that there is not a single *well known* animal of the northern, which is not specifically distinct from every other animal, *equally well known*, of the opposite hemisphere. I have minutely examined all the descriptions of different writers on the cetaceous tribe, and the phocæ, (the most difficult, on account of the number of species, and consequent near resemblance,) and even in those species, in which the fact of identification was considered as most certainly established, I have invariably found important distinctions.

No one, hitherto, I will venture to affirm, has collected a greater number of animals of the southern hemisphere, than myself. I observed and described them all on the spot; and have brought to Europe many thousand species. Let these be compared with the animals of onr hemisphere, and the problem will be immediately resolved—not only with respect to those animals most complicated

and perfectly formed, but in those which are of the simplest organization, and which, on that account, it should seem, would probably be less varied in the system of nature. The comparison, however, will be maintained, even down to the *sponges*, which are generally admitted as the last step in the animal organization. In the wonderful host of antarctic animals, not one will be found which is an inhabitant of th northern seas; and from the most rigorous comparison, the truth of the following position must be admitted, namely, *That there is not one single species of well known animal, which can be truly considered as cosmopolitan, that is common to all parts of the globe.*

Further, (and it is in this that the inexhaustible variety of nature is most apparent,) however imperfect an animal may be, it will be always found an invariable rule, that each class has a distinct region; they are fixed at certain stages; at least there they are found most numerous, and in the greatest perfection; and, as they are met with further from this point, the individuals gradually degenerate until the species altogether disappear. Take, for example, the sea ear, *(Haliotis Gigantea.)* In the polar seas, it attains the length of six or seven inches, and there it forms the valuable banks which furnish food for man. Pass through the Straits of Dentrecasteaux, and we find the size considerably diminished. At King's Island, it is still smaller, and more rare; and it progressively diminishes in size, and its rarity increases; and the type of the largest shell fish of Van Dieman's Land, is hardly to be recognized in the productions of Nuyt's Land; and, by the time we get to King George's Sound, no traces of it are discovered.

It is the same with the *Phasianelles.* Their seat is at Maria Island. There, whole vessels might be loaded with them; and, like the *Haliotis Gigantea*, all traces of them are lost at King George's Sound, after having passed through insensible degradations.

I could easily adduce other instances, but what has been stated, is sufficient to prove, that the class of animals which originate in the cold latitudes, do not advance as far as the torrid zones, without specific alteration and degradation; and the converse of this position is alike true. No country that I have visited, is so rich in the variety and beauty of its *Testacei* as Timor: whilst there, I collected more than 20,000 shells, belonging to several hundred different species, and of this whole number, I never recognized one either in Van Dieman's Land, or on the southern parts of New Holland; and it was not till on the approach to the equatorial regions, that some of the species of Timor were observed.

It is not only with respect to species that this singular exclusion exists, but the same observations occur with regard to genera.

For instance, many genera abound near the equator, which are rarely met with on the colder shores of the two hemispheres; and, whilst at Timor, and the neighbouring islands, such hosts of shells, of infinite beauty and variety, are found, the whole southern coasts of New Holland do not produce more than two or three small inconspicuous species. At King George's Sound, the more splendid classes of Testacei reappear. They succeed, as it were, to the *Phasianelles* and Haliotis, forming the continuatio of the wonderful geographical chain of natural productions.

In this point of view, science appears to offer a new and brilliant field for speculation, and in which the naturalist will derive much assistance, from the outlines which have been so successfully pointed out by the divisions of *Geographical Zoology* of M. De Lacepède, and the works on *Hydrographical Zoology* of M. De Fleurieu—143, Vol. ii.

Art. XVII. *Asiatic Researches.—Vol.* XII.

An incomplete copy of the 12th volume of the Asiatic Researches, as yet unpublished, has reached us, through the kindness of Mr. Colebrooke, containing—

I. An account of the measurement of an Arc on the meridian, comprehended between the latitudes 8° 9′ 38″.39 and 10° 59′ 48″.93 north, being a continuation of the grand meridional Arc commenced in 1804, and extending to 14° 6′ 19″ north. By Major William Lambton, 33d regiment foot.

II. On the Maláyu nation, with a translation of its maritime institutions. By Thomas Raffles, Esq.

III. On the early history of Algebra. By Edward Strachey, Esq.

IV. An Account of the funeral ceremonies of a Burman Priest. Communicated by Wm. Carey, D. D.

V. An Account of observations taken at the Observatory near Fort St. George, in the East Indies, for determining the Obliquity of the Ecliptic in the months of December 1809, June and December 1810. By Captain John Warren, of H. M. 33d regiment of foot.

VI. On the notions of the Hindu astronomers, concerning the precession of the Equinoxes, and motions of the Planets. By the President.

VII. On the height of the Himálaya Mountains. By the President.

VIII. An Account of the measurement of an Arc on the meridian,

extending from latitude 10° 59′ 49″ to 15° 6′ 0″.65 north. By Major William Lambton, 33d regiment of foot.

IX. Translation of a Sanscrit inscription, on a stone found in Bundéle'hand. By Lieutenant W. Price.

X. A Journey to Lake Mánasaróvara in Un-dés, a province of Little Tibet. By William Moorcroft, Esq.

We are not at present enabled to lay before our readers an analysis of the contents of the whole of this interesting volume; we shall, however, give a short extract from the seventh article.

The great central chain of Asiatic mountains, called *Himálaya*, supposed the *Mons Imaus* of the ancients, being inaccessible, by its situation in the midst of nations with which we have had little intercourse, has been hitherto almost unknown.

These mountains have, however, been long believed, in India, to rival, if not surpass in height, all other mountains in both hemispheres. Some evidences of the fact, taken from the narrative of a journey performed by Lieutenant Webb and Captain Raper, have already been published, (As. Res. II. p. 445;) but from further examination of the measurements taken by those gentlemen, compared with some other measurements, the writer of the memoir from which the present article is extracted, considers it now ascertained, that these mountains greatly exceed in height the loftiest peaks of the Andes. We have heard that the hero of natural science, the indefatigable M. Humboldt, intends to explore this range of mountains; and we wait with impatience for the result of his enterprise. In the meantime, our readers will be gratified by a concise statement of the method by which the heights of these mountains have been computed, and of the results of the calculations.

The Himálaya chain is visible from Patna, on the southern banks of the Ganges, as a continued well-defined line of white cliffs, extending through more than two points of the compass, at a distance of about 60 leagues, while, at an equal distance, Chimborago, the highest of the Andes, is seen as a single point, the rest of the Cordillera being invisible. It appears, from Captain Turner's account, that the Peak of Chamalasi, near which he passed, after crossing the frontier of Thibet, is the same mountain which is seen from various sta-

tions in Bengal, the most remote of which is not less than 232 English miles distant. This, in the mean state of the atmosphere, requires an elevation of 28,000 feet, though less may suffice, under circumstances of unusual refraction.

The President himself observed the usual altitude of a peak of the Himálaya to be 1° 1′, as viewed from a station in Bengal, distant, according to Rennell's map, not less than 150 English miles, which, after a due allowance for terrestrial refraction, would give a height of not less than 26,000 feet. According to the mean of several observations of a peak, taken by Lieutenant Colonel Colebrooke, from two stations in the Róhilkhand, namely—Pilibhít and Jét'hpùr, allowing $\frac{1}{11}$ of the contained arc for terrestrial refraction, (which seems about sufficient, on the authority of Delambre, Legendre, and Maskelyne,) its height, above the level of the plains of Róhilkhand, is 22,291 feet, or about 22,800 feet above the level of the sea. It appears, however, from some observations of Major Lambton's, that the medium of the terrestrial refraction in India, it varying from $\frac{1}{4}$ to $\frac{1}{18}$, is about $\frac{1}{8}$; and the different heights in this memoir are computed at both these, and various other rates of refraction. Many more exact observations than the foregoing, made by Colonel Crawford, at Cat'hmándu, in 1802, are stated to have been communicated by him to the President: and another more numerous set, by the same gentleman, is mentioned as being probably now in England.*

According to the observations communicated to the president, Mount Dhaibún is 20,140 above Cat'hmándu, which is itself more than 4500 above the level of the sea; and another exceeds the elevation of the same station, by 17,819 feet—

* Colonel Crawford proceeded, by taking the angles of several selected points, of which he determined the distances by trigonometrical measurement, having taken the bearings from various stations in the valley of Népal, the relative situations of which were ascertained by a trigonometrical survey, proceeding from a base of 852¼ feet, carefully measured four times, and verified by another base of 1582 feet, measured twice. The positions of the same mountains were also settled by observations of them made from the plains of Behar, among observations last referred to.

another by 20,025—another by 18,662 feet. All these are visible from Patna, the nearest being nearly 170 English miles distant, and the farthest about 226 miles.

The Dhawalagiri, or white mountain, supposed to be situated near the source of the Glandac River, was found, by observations of bearings, taken by Mr. Webb, from four points, and of altitudes from three, to be, (allowing $\frac{1}{8}$ for refraction,) 26,784 feet; and allowing $\frac{1}{11}$, 27,551.

Supposing the errors arising from refraction, and those from observation, to be the highest possible, and both in *excess*, the President calculates that its height, above the Plains of Gorakhpur, cannot fall short of 26,462 feet, or 26,862 above the level of the sea. The accuracy of the above mode of computation, is, in some degree, proved, by shewing the agreement, within a few hundred feet of its result, with those of other methods in the case of Mount Blanc.

A barometrical measurement is given, of the height of several mountains of an intermediate chain between the nearest accessible mountains and those of the Himálaya, which were used in the computation of the height of the latter. The folling measurements are given by the writer as near approaches to the truth.

Dhawalagiri or Dhólágír, above Gorakhpur, which is estimated to be 400 feet above the level of the sea,

On a mean of two nearest observations, and at the lowest computation, . . . English feet 26,462

On a mean of three observations, with middle refraction, 27,677

Above the sea, at the lowest computation, . 26,862

Yamunávatárí, or Jamautrí, above the summit of Nagúnghatí, which is estimated to be 5000 feet higher than the sea, ... 20,895

Above the sea, ... 25,500

A mountain, supposed to be Dhaibun, about Cat'hmandú, which appears, by a barometrical measurement, to be at least 4600 feet higher than the sea, . . 20,140

Above the sea, ... 24,740

A mountain not named, observed from Pilibhít and Jét'hpúr, above Rohilkhand, which is estimated at 500 feet above the sea.

On a mean of observations at both stations, 22,291, or more exactly, . . . 22,368

Above the sea, . . English feet	22,768
A mountain not named, observed from Cat'hmandú, and situated in the direction of Calabhairavi, above the valley of Népal, 4600 feet higher than the sea, . .	20,025
Above the sea, ...	24,625
Another near it, above the valley of Népal, .	18,662
Above the sea, ...	23,262
A third in its vicinity, above the valley of Népal, .	18,452
Above the sea, ...	23,052

Art. XVIII. *An Abstract of an Account of the White Mountains. By* Jacob Bigelow, *M. D. from the New England Journal of Medicine and Surgery.*

The subject of this Paper is to detail the observations made by a party at Boston, who visited the White Mountains in the month of last July. The term mountain and hill, are words altogether relative in their signification. Thus, the surface of the lake of Lausanne in Swisserland, is higher than any mountains in the United States: and the city of Riobamba in Peru, is built on an elevation more than twice as great.

In the United States, exclusive, or possibly inclusive, of Louisiana, the highest point or ridge of land is undoubtedly that of the White Mountains in New Hampshire. From the earliest settlement of the country, these mountains have attracted the notice of the inhabitants and of mariners along the coast, by the distance at which they are visible, and the whiteness of their appearance during three quarters of the year (being then covered with snow). They were for a long time the subject of fabulous representations; the Indians had a superstitious dread of them, and travellers who occasionally ascended their summits, returned with exaggerated reports of the difficulty and distance as well as of the strange productions found on the more elevated parts of their surface.

These mountains are situated in latitude about 44° 15′ N. and longitude, 71° 20′ W. from Greenwich; and are distant about 150 miles from Boston.

The party approached them from the north-west, near the

town of Lancaster, on the Connecticut river, 25 miles from their base. Thirteen miles from their base, the White Hills presented the appearance of a continued waving range of summits of which it was difficult to select the highest. At Rosebrook's, (within four miles and a half,) the view of them was very distinct: the character of the summits was clearly discerned, five or six of which were entirely bald, and presented the appearance of a grey and ragged mass of stones towering above the woods, with which the sides and base were clothed. In several places a broad continued stripe descended the mountains, having the appearance of a regular road cut through the trees and rocks from near the base to the summit. On examining these with a telescope they were found to be channels of streams, and in several places the water could be seen dashing down the rocks.

In a plain near the base of the mountains was a pond of one or two acres, situated near the road, and having no other inlet or outlet, appeared to be the principal source of the Saco river. The waters of this stream being collected from several sources, proceed directly toward the side of the mountain. At the point where, to all appearance, they must be intercepted in their course, there occurs one of the most extraordinary features of the place, well known by the name of the Notch. The whole mountain, which otherwise forms a continued range, is here cloven down quite to its base, affording a free opening to the waters of the Saco, which pass off with a gradual descent toward the sea. This gap is so narrow that space has with difficulty been obtained for the road, which follows the course of the Saco through the Notch to the eastward. In one place the river disappears, being lost in the caves and crevices of the rocks and under the shelves of the adjoining precipice, reappearing at length at the distance of some rods below. The Notch gradually widens into a long narrow valley.

There is no part of the mountain more interesting than the scenery of this natural gap: the crags and precipices on both sides rise at an angle of great steepness, forming a support for the lofty ridges above. One of the most picturesque objects was a cliff presenting a perpendicular face, of great height, and crowned at its inaccessible summit, with a profusion of flowering shrubs.

For many miles below the commencement of the Notch, the eye meets on both sides a succcssion of steep and precipitous mountains rising to the height of some thousands of feet, and utterly inaccessible from the valley beneath.

In some instances fire had run over the sides of the mountains, destroying the vegetation, and leaving the dead trunks of the trees standing like stubble in a field, and presenting a singular appearance of desolation for miles in extent.

The White Hills have been ascended by various routes. The course which is usually considered as attended with the least difficulty, and which was adopted by Dr. Bigelow and his party, is that which commences at the town of Conway, and follows the course of Ellis river, a northern branch of the Saco, which has its origin high in the mountains. After leaving the borders of cultivation, the course lies through thick woods, on a level, or with a gentle ascent, not much encumbered with an under growth of bushes, for six miles. The party encamped for the night at the mouth of the New river, a principal branch of the Ellis, which takes its name from the recency of its origin, which happened in October, 1775, when during a great flood which took place in consequence of heavy rains, a large body of waters, which had formerly descended by other channels, found their way over the eastern brink of the mountains and fell down toward the Ellis, carrying the rocks and trees before them in their course, and inundating the adjacent country. By this freshet the banks of the Saco were overflowed, cattle were drowned, and fields of corn swept away and destroyed. Since that period, the New river has remained a constant stream. From the encampment, which was seven miles from the top of the mountain, they proceeded the next day, two or three miles by the side of Ellis river, on a gradual ascent; then leaving the Ellis river for one of its principal branches called Cutler's river, leading directly towards the principal summit. After climbing by the side of the stream for a considerable distance, the trees of the forest around began to diminish in height, and they arrived at the second zone of the mountain. This is entirely covered with a thick low growth of evergreens, principally the black spruce and silver fir, which rise about the height of a man,

and put out numerous long horizontal branches closely interwoven with each other, and surround the mountain with a formidable hedge a quarter of a mile in thickness.

On emerging from this thicket the barometer stood at 25.93. giving the elevation above the sea at 4443 feet: they were then above all woods, and at the foot of what is called the bald part, which arose before them with a steepness surpassing that of any ground before passed, and presenting to view a huge, dreary, irregular pile of dark naked rocks.

Then crossing a plain, a gentle slope of a quarter of a mile, they began to climb upon the side. The ascent of half a mile was laborious, and performed by stepping from one rock to another, as they presented themselves like irregular stairs winding on the broken surface of the mountain. In the interstices of these rocks were occasionally patches of dwarfish fir and spruce, and beautiful tufts of small Alpine shrubs then in full flower. (*July*)

Having surmounted this height, they arrived at a second plain, which, like the first, was covered with withered grass, and a few tufts of flowers. There remained now to be ascended only the principal peaks, designated by the name of the Sugar Loaf, or Mount Washington. The day was uncommonly fine, yet the atmosphere was hazy, and the view of remote objects very indistinct.

The anticipations of the party were not realized in regard to several phenomena they had been taught to expect at the summit. The state of the air was mild; the thermometer stood at 57° Fahr. on the summit: at 12 o'clock on the same day, at Conway, 25 miles distant on the plain below, it was at 80°. The snow lay in patches of an acre in extent upon the sides, but appeared to be rapidly dissolving. They were not conscious of any material alteration in the density of the atmosphere, as neither sound nor respiration were perceptibly impeded. Instead of an absence from these barren regions of animal and vegetable life, multitudes of insects buzzing around the highest rocks, were found, and every stone was covered with lichens, and some plants were in flower in the crevices within a few feet of the summit. The ascent from the encampment at the mouth of New river, including rests, had employed six hours and an half.

The great distance at which these mountains are visible, and apparent length of their ascent, led to estimates of their height, considerably exceeding the probable truth. A mountain barometer of Englefield's construction, stood on the summit, at noon, at 24.23; the thermometer being at 57°. On the same day at Cambridge, this barometer stood at 29.95. and the thermometer at 76°; this difference of the barometer, after making the necessary corrections, would give, according to Sir H. C. Englefield's formula, a difference of 6230 feet in the altitude of the two places. The uppermost or bald portion of the mountain, (1800 feet in height), was found to consist wholly of a loose irregular disconnected heap of rocks.

Gneiss and micaceous schistus, or rather an intermediate substance between the two, prevailed. The mica is abundant and brilliant, but its stratification, uneven and irregular, and often interrupted by thin strata of quartz. Owing to the irregular position of the rocks, the strata were found resting in every possible direction. Large veins of quartz very frequently traversed them, and specimens of pure mica, the plates of which are several inches in diameter, were occasionally obtained.

In the middle and lower parts of the mountain, the micaceous slate appeared to be more perfectly formed, and the strata were remarkably smooth and even, and their fissure presenting the most brilliant silvery lustre. The bed of the cascade at New river, was principally of this material, intersected by thick veins of quartz, which contained large chrystals of schorl. The pebbles in the streams were chiefly of micaceous slate, and occasionally of gneiss, granite, and pure white quartz. They also met with hornblende containing traces of carbonate of lime. In some places where the geology of the mountain was exposed, the lower strata were of green-stone and green-stone slate, with some granite. Higher up, granite and gneiss prevailed; the green-stone is fine grained, containing pyrites; the green-stone slate contains actinote; the granite contains emerald tourmaline, white quartz, and feldspar, white and reddish mica, and garnets of different sizes: the granite is distinctly stratified. The strata of these rocks are from six inches to many feet in thickness, the granite being thickest; generally two or three feet;

the dip of the strata is small, and from the mountain. The rock on the summit, and for some hundred feet below, was gneiss, afterwards granite prevailed. Near the Notch the rocks were of coarse reddish jasper, and porphyry.

The vegetation of the White Hills has been divided with propriety into three zones. 1. That of the common forest trees; 2. that of dwarf evergreens; and 3, that of alpine plants.

The woods which extend from the base up the sides to the height of about 4000 feet from the sea, consist of the rock maple, the silver fir, the hemlock, the black and white spruce, the white pine, the beech, the black, yellow, and white birch; the underwood was composed principally of the Viburnum lantanoides, the Acer montanum and striatum, and Sorbus americana. On the ground was the Oxalis acetosella, beyond every other species of plant, Dracena borealis, Cornus canadensis, Gaultheria hispida, &c.

Where the hispida forests terminate the second zone of the mountain immediately commences, the line between them being very distinctly drawn. This region consists of a belt of the black spruce and silver firs rising to the height of 7 or 8 feet; upon the ground under the ever-green trees, there were but few other vegetables; the Houstonia cærulea, and Cornus canadensis were found in flower.

Above the zone of firs, which terminates as abruptly as it began, is a third or bald region, wholly destitute of any growth of wood; yet to the botanist this is by far the most interesting part of the mountains. Many of the plants of this region were rare, and not to be found in the region below, being for the most part natives of cold climates and situations, such as are found in high latitudes, or in great elevations. Among them were natives of Siberia, Lapland, Greenland, and Labrador. Vegetables of this race, usually known by the name of Alpine plants, have always been found difficult of cultivation, being impatient of drought, and of both the extremes of heat and cold. During the severity of the winter, in their native situations, they are preserved from injury by the great depth of snow under which they are covered, which secures them from the inclemency of the air, while they partake the temperature of the earth below

them. When the snow leaves them, which frequently does not happen till the middle of summer, they instantly shoot up with a vigour proportionate to the length of time they have been dormant, rapidly unfold their flowers, and mature their fruits; and having run through the whole course of their vegetation in a few weeks, are again ready to be entombed for the rest of the year under their accustomed covering of snow. These plants, notwithstanding the high and barren elevations at which they frequently grow, do not suffer for want of moisture, being constantly irrigated by the clouds which embrace them, and by the trickling of water over their roots from the eminences above.

The vegetation in spots extended quite to the top of the mountain. Diapensia lapponica and Lycopodium lucidulum, (the former in full flower) were growing within six feet of the summit. All the rocks were incrusted with lichens, among which Livelleus is the one which predominates, and contributes essentially to the dark gray appearance of the mountain.

In the list of vegetables enumerated by Dr. Bigelow, a considerable number of species are natives of Europe, as well as of America. A question of some interest has arisen whether any plants are originally common to both continents,* and whether those species which approach each other so nearly in their external characters as to be known at present by the same names, are in reality the same species. The analogy of the animal kingdom seems to favour the negative of this question. M. Humboldt has asserted, upon the highest authorities, that no quadruped or terrestrial bird, and even that no reptile or insect, has been found common to the equinoctial regions of the old and new world. In like manner he affirms, that the phænogamous plants which have been recognized as natives of the tropical regions of both continents are extremely few. In the temperate zones, the number of American plants which wear European names, is continually diminishing in books. The separation of them has in some instances been carried further than a strict adherence to the present grounds of botanical distinction will justify. Yet there still remain species wholly

* Humboldt's Memoir on the Distribution of vegetable Forms.

agreeing in their botanical characters, but sufficiently differing in their qualities, places of growth, times of flowering, &c. to render it not improbable, that they are distinct. There is a species of æthusa, grows about Boston, which externally bears the strictest comparison with æthusa cynapium of Europe. It is, however, altogether destitute of the nauseous or garlic taste for which that plant is noted. Menyanthes trifoliata, in New England, flowers a month earlier than in Great Britain, though the seasons in Boston are perhaps always more backward. Botanists have not yet distinguished the chestnut tree of America from that of Europe, although its wood is weak and brittle, and never used, as in Europe, for hoops and other purposes where strength and tenacity are required. On ground like the foregoing, a great number of vegetables which have not emigrated since its discovery, and which are not found far to the north of that country, may be suspected, observes Dr. Bigelow, of being really distinct in nature from those which nearly resemble them in Europe, and are known by the same names.

But as we approach toward the north, and arrive in high latitudes, the probability of finding plants identically the same, is greatly increased. About the arctic circle, the two continents approach each other so nearly, and are so connected by ice during part of the year, that they may, as far as botany is concerned, be considered the same country. The same plants may be equally disseminated on both, and these may extend as far towards the south as the general coldness of the climate suited to their constitution continues. Beyond this they may, for some distance, be found in alpine situations on the tops of the highest mountains. There are also plants of such versatility of constitution, that they bear all the varieties of climate from Hudson's Bay, to Virginia and Carolina. Such plants may well be common to the two continents.

Art. XIX. *An Account of the Earthquake of Caraccas. By M.* Palacio Faxar.

The ridge of mountains, which branches out from the Andes near the isthmus of Panama, and which, taking the direction of the eastern coast, crosses part of New Granada, and Venezuela, seems to have been the seat of that earthquake, which on the 26th March, 1812, destroyed many populous towns of the province of Caraccas. It is this branch of the Cordilliera that forms the Sierra-nevada of Chita, that of Merida-de-Maracaybo, and the height called La-Silla-de-Caracca; and it is between these three remarkable points that the mines of gold of Pamplona, the mineral water of Merida-de-Maracaybo, and the mines of copper of Aroa, are found. Between the picturesque Sierra-nevada of Merida-de-Maracaybo, and La-Silla-le-Caracca, where spring is perpetual, the earthquake was most strongly felt.

At the south-east of this ridge of mountains, there are plains of an immense extent, covered with different species of grasses, and watered by innumerable torrents, which falling from the mountains, and uniting in different bodies, majestically enter the Orinoco. These plains were likewise convulsed for above one hundred and twenty leagues in Venezuela: the towns situate immediately at the foot of the Cordilliera, or in the valleys between them, suffered most severely: those seated in the plains did not suffer considerable injury, though violently shaken. For five months a continued drought had parched the earth, no rain having fallen, and in the preceding month of December, a slight shock of an earthquake had been felt at Caraccas. It was on the eve of the Crucifixion, when Catholics assembled together in their churches to commemorate with public prayers and processions the sufferings and merits of their Redeemer, that this sad catastrophe happened. The weather was fine, the air serene, when between four and five P. M. a hollow sound like the roar of a cannon was heard, which was followed by a violent oscillatory motion from west to east, which lasted about

seventeen seconds, and which stopped all the public clocks: the convulsion diminished for some moments, but was succeeded by a more violent shock than the first for twenty seconds almost, keeping the same direction : a calm followed, which lasted about fourteen seconds, after which the most alarming trepidation of the earth took place for fifteen seconds. The total duration about one minute and fifteen seconds. The inhabitants of Caraccas, struck with terror, unitedly and loudly implored the protection of heaven; some ran wildly through the streets; some remained immoveable with astonishment; while others crowding into the churches, sought refuge at the foot of the altar. The crash of falling buildings, the clouds of dust from their ruins, which filled the air, the anxious cries of mothers, who enquired in vain for their children lost in the tumult, increased the horrors of this sad day. To this scene of disorder succeeded the most horrible despair. Dead bodies, wounded persons crying for protection presented themselves every where to those who had escaped from the catastrophe, and who could not turn their eyes from these objects of pity and horror, without meeting with heaps of ruin, which had buried hundreds of unfortunate persons, whose lamentations uselessly pierced their hearts, for it was impossible to give relief, or assistance to all.

It has been computed that in this calamitous day, near twenty thousand persons perished at Venezuela. A great part of the veteran troops were of this number; and all the arms destined for the defence of their country were buried under the ruins of the barracks. The towns of Caraccas, Merida-de-Maracaybo, and Laguaira were totally destroyed; those of Barquirineto, Sanfelipe, and others suffered considerably. It is to be remarked that Truxillo, which is situate between Merida-de Maracaybo, and Sanfelipe, experienced very little damage. At the last place, near the mines of Aroa, the first signal they had of the earthquake was an electric shock, which deprived many persons of their power of motion; and in Valencia, Caraccas, and the neighbouring country the inhabitants were for about twenty days after the earthquake, in an extraordinary state of irritability. Many persons, who suffered from intermittent fevers, recovered immediately in consequence of the effect of the earthquake.

At Vallecillo, near Valencia, a rivulet spouted out from a hill, which continued to flow for some hours after the earthquake, and which I visited a few days after. The river Guaire, which runs through the valley of Caraccas, was greatly swelled soon after the earthquake, and remained in that state for several days. The water of the bay of Maracaybo withdrew considerably, and it is said that the mountain Avila, which separates Caracccas from Laguaira, sunk several feet into the earth.

The earthquakes continued for many days, we may say, without interruption: they diminished as it were by degrees, though the last were remarkably strong. So late as the month of October of the same year there was a violent shock. The earthquake of the 26th March was felt at Santafé-de-Bogotá, and even at Carthagena, though it was very little felt at Cumana.

In the following April a volcano burst out in the island of St. Vincent. About the time of the eruption, a noise like that of a canon was heard at Caraccas and Laguaira, which caused a general alarm, the inhabitants of each place supposing that the neighbouring town was attacked by the enemy. This roaring noise was distinctly heard, where the river Nula falls into the Apure, which is more than one hundred leagues from Caraccas. In the same year, 1812, many strong shocks of an earthquake were felt at Samaica, and Curacoa.

The earthquake of the 26th March alarmed so deeply the inhabitants of Venezuela that they expected to see the earth open and swallow them at every convulsion, and it having happened on the anniversary of their political revolution, made them suppose it had incurred the displeasute of the Almighty. The clergy, who were enemies to the revolution, as their privilege had been diminished by the new constitution of Venezuela, availed themselves of the disposition of the people, and preached every where against the new republic. Such was the beginning of the civil war at Venezuela; a war, which has desolated those beautiful countries, and which has destroyed the tenth part of their population.

M. PALACIO FAXAR.

London the 1st *December,* 1816.

Art. XX. *On the Restoration of Vision, when injured or destroyed in Consequence of the Cornea having assumed a conical Form. By Sir* William Adams.

Among the causes producing short sight, is a morbid thickening of the transparent cornea, which has been usually termed Conical Cornea. One of the first, and, I may add, the best descriptions yet given of it, has been by Doctor Léveillé, an eminent French physician, and translator of Professor Scarpa's work on diseases of the eye, into the French language.

The conical cornea, although a disease, not so frequently met with as many other morbid affections of the eye, is yet by no means of rare occurrence; and any curative effort which is capable of being successfully exerted, becomes the more interesting, the advanced stage of the disease, (as far as I have been able to learn,) having been hitherto considered by authors as incurable.

It is, therefore, highly gratifying, that the resources of art are found competent to afford effectual relief even in this apparently hopeless case, in which, although it is impossible to remove the disease itself, when thus fully formed, yet, by taking away one of the healthy parts of the eye, whose use is similar to that of the diseased growth of the cornea, (which does not admit of removal,) vision, it will be shewn, may be restored nearly to perfection.

The malady in question commences by a morbid growth of the whole substance of the cornea, without inflammation or opacity, but more particularly its central part, situated opposite to the pupil, and the patient's degree of short sight increases in exact proportion to this growth. Its advance, unless arrested by the appropriate medical treatment, is usually slow, but progressive, until, at length, the cornea, instead of being a regular segment of a sphere, wholly losing its natural curvature, assumes a conical form. This change of structure produces some curious phenomena in the appearances as well as the uses of the cornea. On examining this tunic in front,

it assumes an unusual degree of sparkling brilliancy, nearly resembling crystal, except, (as is sometimes the case,) where there is an opacity in the apex of the cone. Doctor Léveillé attributes this brilliancy to the cornea's strongly reflecting, instead of transmitting, the rays of light, by which he supposes, that the pupil becoming contracted, in a strong light, thereby producing an imperfect and confused sight.

This explanation of the cause of the patient's imperfect vision, it will, however, be hereafter shewn, is erroneous. If the cornea be examined laterally, the thickening, it will be observed, gradually increases from its circumference to its centre, where the apex of the cone is usually seated, although, in some instances, I have seen it on one side of the centre. When the cornea is similarly examined, opposite to a strong light, its thickness at the base may in general be traced, while the sugar loaf form of the apex renders it impossible to be mistaken for any other disease of the eye.

The change which this disease produces, in respect to vision, is very important. Soon after the commencement of the diseased growth, the patient complains of being unable to see objects distinctly, at the usual distance; and his power of vision becomes gradually shortened, in proportion as the disease advances, until, at length, he is unable to perceive minute objects with any degree of distinctness, however near they may be placed to the eye; and cannot make out large ones when above three or four feet distant. In fact, vision is destroyed in relation to the useful purposes of life, and he becomes nearly as dependent as if totally blind. Indeed, I once saw a young lady labouring under this disease in both eyes, who did not venture to go any where without a guide.

The disease generally begins at the first in one eye, and a similar affection most commonly succeeds in the other. I have met with it in almost every stage of life, from a girl of sixteen to an old lady of seventy, and am not aware that it is peculiar to any sex or age, although I have certainly seen it much more frequently in women than in men, and more in young than in old persons.

The opinions generally entertained of the cause of the

ease in question, appear to me to have been incorrect, and have necessarily led to an erroneous practice, in the attempts which have been made for its alleviation. The conical form of the cornea has been atributed to an over-distention of that tunic, occasioned by a superabundant secretion of the aqueous humour, which, continually stretching the cornea, has gradually occasioned it to yield to the pressure from within, and thus produced the alteration in its form. To remove this supposed over-distension, it has been usually recommended to evacuate the aqueous humour, by puncturing the cornea, and afterwards to employ pressure—astringent collyria, &c. to prevent its reaccumulation. Experience has, however, shewn the total inutility of these modes of practice. The operation of evacuating the aqueous humour has been, in some instances, repeated several times, without any permanent advantage being found to result from it; and, although it is an operation neither painful nor difficult to perform, yet is sometimes dangerous; for if the crystalline lens should be wounded by the instrument with which the puncture is made, cataract will most likely ensue; and I have been informed of a case, where this actually occurred, during the attempt to evacuate the aqueous humour.

Having, at an early period of my practice, been impressed with the opinion, that the conical form assumed by the cornea in this disease, was the effect of a morbid growth of that tunic; and that the short sight experienced by the patient, was to be attributed to its increased refractive power, and which, together with part of the crystalline lens, brought the rays of light to a point far short of the retina, it occurred to me, that as it was impossible to remove the morbid growth of the cornea, without rendering it unfit for the transmission of light, a useful degree of vision might be restored by the removal of the crystalline lens. I was the more strongly led to form this conclusion, after having myself tried the experiment of looking through deep convex spectacles, such as are employed by patients after the removal of cataract, which, I found, produced a confusion of sight, very similar to that

which I had heard described by persons in whom the cornea had been conical in the extreme degree. I, therefore, resolved, more than six years since, while surgeon to the West of England Eye Infirmary, instituted at Exeter, to remove the crystalline lens in a case in which that body had become opake, and also affected with conical cornea. Some circumstances, however, prevented the patient, who was a young woman, and a pauper, from being sent to me to the Infirmary. About three years since, another patient, from the country, an old woman, nearly seventy years of age, placed herself under my care, labouring under this disease, accompanied with cataracts, in whom I successfully removed both the cataracts, and had the gratification to find her vision thereby restored to an extent which far surpassed my most sanguine expectations. I observed that she was capable of seeing much more distinctly without convex glasses than is usual for persons who have undergone the operation for cataract, while, with a convex glass, she could read small print without any difficulty. Not being able to ascertain the degree of vision which this patient experienced previously to the puncture of the cataracts, nor whether the diseased change was going on in the cornea and crystalline lens at the same time, I necessarily cannot state the exact amount of the benefit which she derived from the operation. This, however, was demonstrated—that, by the removal of the crystalline lens in eyes affected with conical cornea, nearly perfect vision was restored; while, it is well known, that in cases of conical cornea, where no cataract exists, vision is usually as imperfect as if the latter malady formed a part of the patient's disease.

The favourable result of this operation fully confirming the opinion which induced me to perform it, I determined, at the earliest opportunity, to try the effect of removing the crystalline lens, as a remedy for blindness produced by conical cornea. A favourable case presented itself the following year, in a young woman, who, during six years, found her sight gradually decreasing, and, at the expiration of that period, had become so blind, from this disease, as to be unable to continue

her employment as a servant, and was in consequence obliged to apply for parochial maintenance. Shortly afterwards she was sent to an Eye Infirmary in London, where receiving no benefit, she was subsequently brought to me, and solicited in the most urgent terms the trial of any practice, which afforded a prospect of restoring her to sight. I carefully examined her eyes, and found that the cornea of both eyes had assumed the conical form in a great degree, attended by a slight opacity in the apex of each cone, but none whatever in the crystalline lens. She could walk without a guide, and could see at three or four feet distance, so as to avoid running against any person, but had entirely lost the power of reading, or perceiving minute objects, however nearly they were placed to the eyes.

I effected the removal of the crystalline lens, by causing it to be absorbed, which method of operating is to be preferred to every other hitherto practised, whether the lens be opake or not, in cases where, like the present, it admits of being freely divided. The patient, however, returned to the country before the eye had entirely recovered from the operation, and I did not see her again until nearly twelve months afterwards, when I was in the highest degree gratified to find her capable of discovering minute objects, and reading the smallest sized print, without the assistance of a glass, while holding the book at the usual distance of ten or twelve inches from the eye, nearly as well as she ever recollects to have done. The usual cataract spectacles for near objects, of two inches and a half focus, confused her sight nearly in the same manner as before the crystalline lens was removed, while with those of nine or ten inch foci, her capability of seeing minute objects was somewhat improved. She saw objects at a distance better without than with any glass I could find; whereas the usual standard for distant vision, after the operation for cataract, is four inches focus. She now neither uses a glass for near nor distant objects, has again returned to service, and a gentleman told me, who has recently seen her, that she accurately described to him an object which was considerably more than a quarter of a mile distant. Twelve months after undergoing

this operation, I operated upon the other eye, but she again left town before the eye had recovered itself, and before the lens was entirely absorbed. Previously, however, to her departure, she could read small print with this eye, by the assistance of a convex glass of two and three quarters inches focus, while with one of nine inches focus the sight was greatly improved in viewing distant objects.

As the degree of conical form of the cornea appeared to be the same in both eyes, and as the patient was equally blind in both eyes before the operations, it is a curious circumstance, and deserving notice, that the two eyes should require glasses differing so much in their refractive power. Not being able to obtain any other information from the patient as to the progressive amendment of her vision, during the twelve months she remained in the country, between February 1815 and February 1816, when she underwent the operation upon the second eye, except "that her sight continued to get stronger," (an indefinite mode of expression made use of by poor people in their recovery from almost every species of diseased eye) I cannot undertake to afford any authentic data for the hypothesis which I venture to offer as an explanation of this phenomenon. It appears to me that the greater degree of improvement of vision in the eye first operated upon, might be occasioned by the increased susceptibility of the retina from the exercise of that organ, and the power the eye had acquired of adapting itself to see near and distant objects distinctly, during the interval of twelve months the patient was absent; whereas the trial with the two and three quarters convex glass for near objects, and nine for distant ones, on the eye last operated upon, was made only a few weeks after the operation, and even before the attendant inflammatory action had subsided, or the whole of the lens become absorbed. I am led to adopt these opinions from observations made in numerous instances upon persons who have successfully undergone the operation for cataract, and who almost uniformly require deeper convex glasses to see distinctly immediately subsequent to the operation, than are necessary afterwards. That the retina and optic nerve become partially insensible from not

being exercised, and acquire their natural susceptibility when again brought into use, are facts which I have so often witnessed, that I judged them sufficiently confirmed to insert them in my practical observations on diseases of the eye; and I have also generally observed, more particularly in poor persons, who from the inconvenience attached to wearing spectacles, appear to feel an objection to their use, that although they are unable to see either near or distant objects immediately after the operation, without glasses, yet, after a time, they acquire the power to a considerable degree of perfection, if they have the patience to do without them. I cannot elucidate these opinions better, than by instancing three cases which have occurred in the extensive opportunities I have had of making similar observations among the patients on whom I have operated for the cataract.

The first was a postillion who had been blind nine years in one eye, and three in the other. Both cataracts were successfully removed by the operation effecting their absorption, and when he resumed his employment as a postillion, he was, from necessity, obliged to wear his spectacles, not being able even to walk without them; but finding that his passengers were frequently apprehensive of their safety, from being driven by a person requiring spectacles, he by degrees left them off altogether in the day, and in the course of twelve months he could drive quite as well without as with them. At night, however, when the rays of light being comparatively few in number, required the most complete concentration upon the retina, to produce a sufficient impression upon that membrane for the purposes of vision, he still derived great advantage from the use of distant sight spectacles. The poor fellow died of pleurisy about two years after the removal of the cataracts. Had he lived, it is probable the susceptibility of the retina would have so far increased, and the adjustive powers of the eye so much improved, that he would have seen even at night, sufficiently well without the use of any glasses.

While at Exeter I effected the removal of cataracts in a young man twenty years of age, who was born with them.

The cataracts were originally fluid, but, as is usually the case when this species is suffered to remain for any long period without being operated upon, the fluid first had become absorbed, leaving nothing but an opake capsule containing the grosser parts of the cataract. With the right eye he could see brilliant colours, and perceive light from darkness, but could not discriminate any object; with the left I found him capable of seeing objects at a distance indistinctly, and of distinguishing large sized letters when held in an oblique direction within two inches of his eyes, and with his back turned to the light. If, however, he attempted to read facing the light, he entirely lost this power, and under the most favourable circumstances, the sphere of vision was so circumscribed, that it did not include above three or four letters at a time. To my surprise, as soon as the eye had recovered from the operation, he was able, without spectacles, to see both near and distant objects with a degree of precision quite unusual without their aid. He returned home at the end of ten weeks (a fortnight only after a second operation, which was performed on one eye) and I did not again see him for about nine months, when I found him capable of reading and writing with *both eyes*, without the assistance of glasses, although with one of them he had never, previous to the operation, been able to discern objects from his birth.

I now engaged him as a footman, being perfectly competent to execute the usual duties attached to this station, except to judge accurately of distances; he could not at this time snuff a candle with certainty, or pour liquids into a small glass. He neither used spectacles to see near or distant objects by night or day, but he always held small ones more than usually near to his eyes when he wished to view them attentively, in doing which he knit his brows, and appeared strongly to exert the powers of the eye. He saw, to all appearance, at as great a distance as any other person, and was fond of viewing extensive prospects. The scenery about the Irish and Scottish lakes seemed to delight him exceedingly. Finding him however incorrigibly idle and inattentive, I was obliged to discharge him at the end of the first year, when his knowledge

of distances was so much improved, that in the service where he afterwards lived in the country, he for some time acted as coachman.

Two very extraordinary facts occurred in this case; first,—the patient's immediate capability of adjusting his eyes in viewing different distances; secondly,—his having so soon established the susceptibility of the retina of that eye in which he had not seen previously to the operation. The first may, I think, be satisfactorily explained by supposing that in his best eye, the power of adaptation had been acquired previously to the performance of the operation, for the crystalline lens having been opake, and nearly absorbed, was not only useless in effecting the natural refraction of the rays of light, but also actually impeded them in their progress to the retina, the only passage by which they could make their way to the bottom of the eye, being through the edge of the capsule, where it was less opake than in its centre. In the passage of the rays of light through this portion of the capsule, it is evident, very little, if any refraction, could take place, and it therefore required the adjusting powers of the eye to be exercised in order to enable him to see near and distant objects previous to the operation, quite as much, if not more than if the lens had been actually removed.

Thus, then, that power which usually takes a patient six or twelve months to acquire after the removal of the lens in ordinary cases, was possessed in this previously to the performance of the operation.

The small space at the edge of the capsule, through which alone the light was capable of making its way to the retina, explains the necessity of the patient turning his back to the light in order to effect a dilatation of the pupil, for when he faced the light, from the contraction of the pupil, the iris covering the greater part of the space in the capsule through which the light passed, necessarily occasioned a still greater diminution of vision than he previously experienced.

The same cause accounts also for his being obliged to hold small objects in an oblique direction, and for his seeing but three

or four letters at a time, for had the part of the capsule through which the light passed, been in the centre instead of at the edge, and also been of a large extent instead of being confined, he would consequently have seen objects straight forwards, and have possessed the power of taking in a much larger extent of vision. The opinion that the latter effect was occasioned by the small space through which the light had to pass is confirmed by my having generally observed, that where the pupil is naturally small, the field of vision is proportionally circumscribed. In one instance of a patient who came to me after he had undergone a number of operations for cataract, in a public Institution, I found the pupil so much contracted as to render it dangerous for him to walk in the streets by day, and entirely to incapacitate him from doing so alone at night. After forming an artificial pupil of a proper size, he was enabled to see even the nails of his fingers when the arms were extended to the utmost at right angles with the body, nearly as distinctly as he could before I operated upon him, when placed immediately before his eye, and he now sees to walk at night as well as other persons.*

With respect to that eye of my late servant with which he had never seen previous to the operation, and the retina of which so quickly acquired its susceptibility, it certainly was a very unusual circumstance; for, as I have already observed, and as will be fully exemplified in a case hereafter detailed, it in general requires a considerable time to restore by exercise the want of sensibility occasioned by its having long been dormant.

I have however, lately seen another similar instance to the contrary in a young man of thirty years of age, born with cataracts, with one of which, as in the above case, he never had seen more than to distinguish brilliant colours, and perceive light from darkness. The fragments of the cataract having, spontaneously become depressed immediately on the breaking up the lens, he instantly saw light much more strongly than he had done before. On the following day he saw all the objects around him, and at the expiration of a fortnight, when the eye

* See Plate II. and Case 10. in my work on Diseases of the Eye.

had recovered itself, he could, with the assistance of glasses, distinctly discriminate the minutest objects, even the seconds and minute marks, on my watch dial.

The third case is entirely opposite in its bearing to the two former. About seven years since, I operated upon a young gentleman born with partial cataracts. The centre of the crystalline lens was opake in both eyes, but the circumference in each was transparent, which afforded him an indistinct but very useful vision, he being able to read small Greek character, and to see distant objects,[a] although not as far or as distinct as other people, yet sufficiently for general use. I removed the whole of the lens by the operation for absorption, when with the assistance of properly adjusted glasses, he saw with his best eye both near and distant objects to the utmost extent of his expectations and wishes; with the other, the retina of which had become insensible from never having been in the habit of exercising it, he could see but very little. After the operation he habituated himself constantly to use spectacles for distant as well as for near objects, and he is now at the end of seven years unable to avoid running against persons, or the furniture of a room, if he attempts to cross it without them; whereas, with spectacles, he sees sufficiently to have become an expert shotsman. There can be no doubt that the inability of this gentleman to see objects has arisen from his not bringing the adjusting powers of the organ into action in consequence of habitually using his two kinds of spectacles which effected the necessary refraction of the rays of light to see both near and distant objects, without occasioning any exertion of the eye, whereas if he had felt the same necessity of doing without them soon after the operation, as described in the case of the Postillion, he would unquestionably have succeeded equally well. It is also evident that by the removal of the crystalline lens, he lost the power which he previously possessed, of adjusting his eyes to different distances, although their partial opacity prevented his seeing either near or distant objects as well as other persons, and which power, owing to the habitual use of convex glasses, of $2\frac{1}{4}$ or $2\frac{3}{4}$ for near, and 4 or $4\frac{1}{2}$ for distant objects, he has not since re-acquired.

From a consideration of these three cases, am I not then jus-

tified in hazarding the conclusion that whatever power the crystalline lens possesses of adjusting the eye to different distances, yet, after its removal, there is another power of adjustment, which (as in the former cases) can be subsequently brought into action by exercising the organ without glasses, but which power (as in the latter) is not called into action when glasses are continually employed?

I have myself full confidence in this opinion, having, after the removal of the crystalline lens, almost uniformly witnessed similar results from similar exercise of the eye. The partial insensibility of the retina before spoken of, as a cause for the necessity of using a deeper convex glass soon after the operation, for the purposes of vision, than is afterwards required, cannot apply to the best eye of this gentleman; for to the period of the operation, he exercised it in the prosecution of his studies, while its necessity for the other, the retina of which had become torpid for want of being exercised, was strikingly exemplified, it being a considerable time after the operation, even with the assistance of the deep convex glass, before this eye had acquired any degree of useful vision. At the present time its powers are very inferior to the other, from being less employed in consequence of the patient's chiefly relying on his best eye.

In returning to the consideration of the case detailed of the young woman with the conical cornea, it may perhaps be supposed, that by admitting the susceptibility of the retina to have been encreased by its being twelve months exercised after the operation, and the adjusting powers of the eye to have been acquired from the same cause, that I abandon my opinion of the morbid degree of separation of the light in its passage through the thickened cornea, together with the natural refraction produced by the crystalline lens being the cause of the confused and imperfect vision previously experienced by the patient; this however is not the case, as the fact of the girl being capable of seeing after the removal of the lens, *which was not in the slightest degree opake,* after having been blind previously, shews clearly that the refractive powers (the conical cornea and crystalline) were too powerful, and that the cure was effected by the removal of one of them. But what I conceive proves the

accuracy of these inductions is, that in the earlier stages of the disease, when the thickening has not attained the height it had reached in the case alluded to, the greatest assistance is afforded to the patient's vision by the employment of common glasses. It is not, however, my intention to urge that the refractive power is equally great in the thickened cornea as in the crystalline lens; on the contrary, I think that a convex glass of a less magnifying power than that usually required after the removal of cataract, may be frequently employed to great advantage in cases of conical cornea: were any further arguments necessary than those adduced to prove that the short sight of the patient is occasioned by the morbid thickness of the cornea, and not from the superabundant quantity of the aqueous humour as has been supposed, it would be, the well-known fact that water possesses little comparative refractive power, while, from the dense structure and the form of this conical cornea, it is quite evident that its powers of refraction must be very considerably increased.

Although I may have failed in convincing my readers of the accuracy of some of the opinions which I have ventured to submit in this paper, yet I have the gratification of knowing that I have fully proved the important fact, of having successfully carried into effect a mode of treatment capable of restoring vision in a case incurable by other means, and which, as far as I have been able to ascertain, has hitherto never been employed by any other person.

Art. XXI. *Analytical Review of the Scientific Journals published on the Continent, during the preceding Quarter.*

JOURNALS PUBLISHED IN SWITZERLAND.

Bibliothèque des Sciences et des Arts.—Geneva. Monthly.

In the last number of the Journal of Science, we merely announced the successive and rapid appearance of the Numbers

for January, February, March, April, and May, of the *Bibliothèque*, We now proceed to analyse the Numbers that have subsequently been published, and which more immediately fall within our plan of noticing the most recent publications. We begin, therefore, with the Number for June. It is needless to remind our readers, that the Journal under consideration is a *new* series of the well-known and justly esteemed periodical work, entitled *Bibliothèque Britannique*. In changing the name, however, the editors have also considerably altered their former plan and arrangement. The literary or scientific productions of Great Britain were the chief and almost exclusive subjects of their notice, in the former publication; and thus constituted, their Journal found its way into almost every corner of the Continent, where science and the belles-lettres are at all cared for; and where the great progress made by the English in both those branches of learning could not be known by any other means, in consequence of the obstructed communication between the Continent and our island.

In embracing, as they now propose, a wider field of observation, the editors have certainly given a new character to their publication—that of variety; but to support this to that degree of worth, which a select though limited miscellany possesses, more strength of talent, and other various qualifications, are required, than fall generally to the lot of two or three men, confined to a small capital, with every sort of difficulty besides that of the undertaking itself, before them. To give an accurate and satisfactory account of what is done in England, may come within the fair reach of the exertions of an intelligent editor; but when his attention is to be diverted by a variety of observations on the productions of every other country in Europe, it is to be feared that he will fail to do justice to his subject. "Cela tient à la nature des hommes."

JUNE.

Art. I. *Recherches sur l'Electricité atmosphérique. Par M.* Schübler.

In calm and serene weather the atmospheric electricity, according to our author, is constantly positive, subject, how-

ever, to two daily fluctuations. It is at its *minimum* a little before sunrise—it then gradually accumulates and reaches its *first maximum* a few hours afterwards (eight o'clock in May). At this period the electricity begins to diminish, till it has successively descended to its second *minimum*.

The second *maximum* of atmospheric electricity exists, in the evening, about two hours after sunset; it then diminishes, at first rapidly, and next, in a slower progression, during the whole of the night, to present again on the following day the same oscillations.

These regular fluctuations may be observed throughout the year; more easily in fine than in cloudy weather; and of a greater duration in summer than in winter.

The proximity of the two *maxima* of electricity in winter induced some meteorologists to believe, that there existed but one *maximum* during the cold season. This, of course, is an error.

The diurnal electrical fluctuations seem in no way influenced by the temperature; for although their first *minimum* takes place at sunrise, when the air is the *least* heated, the second, on the contrary, occurs at the period of the *highest* diurnal temperature. The hygrometrical state of the atmosphere, on the other hand, according to M. Schübler, seems greatly to modify its electrical oscillations; for the two *maxima* of the latter occur a little after sunrise and sunset, at which periods, the author thinks, that the air presents the greatest quantity of vapour. In endeavouring to explain this analogy between the atmospheric electricity and the hygrometrical modifications of the atmosphere, Mons. Schübler is not perfectly clear; at least *we* cannot understand him, since even the *expressions* employed, to account for such a phenomenon, are new to us, as applied to the present question.

But the theoretic part of observations, in themselves new, is seldom as interesting as the facts which may be deduced from them; and we find this opinion illustrated by Mons. Schübler's example. Thus the practical observations contained in his Memoir are both curious and interesting. For instance. When water falls in the state of rain, snow, or hail, it is electric,

and its electricity is superior to that of the atmosphere. The electricity is sometimes positive, and at other times negative.

Rain without any electricity occurs seldom. Such a phenomenon is only to be observed when the state of electricity of rain changes suddenly from positive to negative; or when the rain is very insignificant.

The electricity of rain is greater in summer than in winter, yet two showers succeeding each other at a short interval possess sometimes an opposite electrical state, though of the same degree of intensity. In the course of one year the positive electricity of rain has been observed 71 times, and the negative 69.

Snow is oftener positive than negative—as 24 : 6.

This Memoir is illustrated by two tables presenting the electrical variations of the atmosphere at different hours in the day—the state of the thermometer and of the weather—the march of the barometer and of the magnetic needle.

The observations of Mons. Schübler were made in the vallies of the south of Austria; and with Volta's apparatus of comparative electrometry.

Art. II. *Breve Notizia, &c. or Notice abrégée des Progrès de l'Astronomie en Italie dans les quinze premières Années de ce Siècle.*

This article is a translation from the Italian Journal published at Milan, which we have promised, and shall have occasion to notice in this Number.

Art. III. *Ephémerides Astronomiques de Milan pour l'Année bissextile* 1816, *calculées par M.* Carlini.—*Milan.*

It can be of but comparatively little interest to us, after having happily reached the conclusion of the *année bissextile,* to know what foreign astronomers may have said of it before its beginning. But amongst the articles of transitory importance contained in this work, we find others of a different description, which induce us to notice it, though in other respects out of date.

Amongst these are a continuation of the observations made

by A. Cesaris on the periodical oscillations of buildings, respecting which some experiments had been made, and their results published in the *Ephémerides* for 1815, whence it appears, that there is actually an angular movement = to 2″ in the walls of buildings, influencing, of course, the observations made with instruments attached or in any way connected with such walls—and that this phenomenon depends on the action of the sun's rays on buildings during fine weather.

The other interesting article is by the same author, and gives, amongst other important meteorological information, a very singular conclusion derived from observations, by which it appears, that the rain at Milan has been constantly augmenting from 1764 to the epoch at which the calculation was published. Thus between

	inch.	lin.
1764 and 1781 the mean was	32 .	11
1773 and 1790 ————	32 .	17
1782 and 1799 ————	34 .	11
1791 and 1808 ————	35 .	8
1800 and 1814 ————	38 .	9

Art. IV. *A System of Mineralogy.* B. R. Jameson, *&c.*

This is a review of the work thus announced, preceded by a general view of the present state of mineralogical science in Great Britain, in which the zeal of individuals, and the activity of the various Societies entirely dedicated to the cultivation of that science, are properly mentioned, and brought forward as a stimulus to others for imitation.

Art. V. *Medico-Chirurgical Transactions, Vol. VII. &c. &c.*

This is a translation of a remarkable case of apoplexy observed by Dr. Odier of Geneva, and read before the abovementioned Society last winter.

Art. VI. *A Memoir on Evaporation. By Mons.* Bellani.

We shall have occasion to speak of this paper when giving an account of the Italian Journal from which it is taken.

Art. VII. *Proceedings of the Royal Society of London, from April to 23d May.*

Art. VIII. *Proceedings of the Royal Society of Edinburgh, from April to the* 1st *of May.*

Art. IX. *Note sur la Marche progressive de l'un des Glaciers de la Vallée de Chamouny. Par le Prof.* Pictet.

The *glacier* in question is that of *Bossons,* the third on ascending the Valley of Chamouny. It has advanced, in some directions, about fifty feet, thereby creating some alarm among the neighbouring villagers.

JULY.

Art. I. *Traité de Physique expérimentale et mathématique. Par* J. Biot, *&c. &c.*

This is the third and last article of the review given in the Bibliothèque of this important work, which we have also promised to notice at a future period.

Art. II. *Considérations sur les Taches du Soleil, et Observations de celles qui ont paru l'Année dernière et celle-ci, recueillies par le Prof.* Pictet.

Mons. Pictet seems greatly alarmed lest the fortuitous coincidence of a cold and rainy season, and the appearance of some spots in the sun, should be mistaken for *cause* and *effect,* from which the imagination of *badauts,* and even *bons esprits,* might deduce the unwarrantable conclusion, that the sun may, in time, and that at no very distant period, become wholly incrusted, so as to plunge us at once into the unutterable darkness that characterised the primitive chaos. To prevent so much mischief, the Professor has taken great pains to shew—1st. That the solar spots cannot have had the least influence on the season; for, in that case, it would have been general, a circumstance which the accounts from Russia tell us not to have existed. 2d. That the spots in the sun are neither a new nor a rare phenomenon, for they have been observed repeatedly, ever since the invention of the telescope.

Having thus fulfilled the most benevolent part of his intention in writing the present Memoir, Professor Pictet proceeds

to the merely curious and scientific portion of his subject, in which he has the happiness of being materially assisted by the original observations of his friend and countryman, Mons. Eynard, senior—observations which are illustrated by appropriate diagrams in an annexed plate. M. Eynard has paid particular attention to the spots in the sun; so much so indeed, as to be almost inclined to suspect, from a calculation of their return, in reference to the earth, that the sun's rotation is subject to some acceleration. In his conclusions, however, he is perfectly accommodating, "For," says he, "whether we consider the sun's spots, according to Herschell, to be the mountains of the sun piercing through the luminous atmosphere which surrounds them—or whether we imagine, with Biot, that these spots are some enormous openings in the sun's body, from which torrents of fire are flowing;—it is equally certain, that no diminution of the luminous, and consequently of the calorific fluid, can ever take place." Good! But suppose neither of these opinions to be the right one, how is this astronomical phenomenon to be explained?—Mons. Eynard has not provided himself with an answer, in such a case; nor has M. Pictet supplied the deficiency.

Art. III. *Considérations sur la Nature des Causes qui maintiennent constante, la Proportion de l'Azote et de l'Oxigène dans l'Atmosphère. Par* Benedict Prevost, *Profes. de Philosophie, &c.*

The author had the curiosity, some years ago, to compare the weight of the atmosphere to that of a considerable mass of a very heavy substance,—such as a cubic league of gold, platinum, mercury, &c. He deduced from it the weight of oxygene, and by an approximate calculation he found, that the quantity which in a year combines with carbon, and forms carbonic acid, from all known causes is so extremely small, that even were it not replaced or again set free through the atmosphere, it would be impossible to discover its diminution by the means now employed.

The data and suppositions on which this calculation of Mons. Prevost is founded, are the following:

1. The earth is spheric—its radius = 3266600 toises.

2. The sum of all the surfaces of the continents and islands, above the level of the sea, is equal to one-fourth of the whole surface of the globe.

3. The mean elevation of the dry land all over the globe is = 2000 toises.

4. The constitution of the atmosphere is the same at all heights.

5. Abstraction is made of the diminution of gravity in the upper regions of the atmosphere.

6. Mean elevation of the barometer at the level of the sea, = 28 inches.

7. Specif. grav. of mercury, = 13.6.

8. The league at 25 to a degree = 2280,5 toises.

9. The water, carbonic acid, and other heterogeneous substances, commonly existing in the atmosphere, form $\frac{1}{50}$ of its weight.

10. 1000,000,000 men inhabit the surface of the earth.

11. Every man consumes daily two pounds of oxygene.

12. All other animals, comprising those which breathe the air in water, consume twice as much.

13. By the fermentation of vegetable earth, and combustion, a quantity of oxygene is consumed equal to that consumed by man.

By a calculation on the first eight suppositions, the weight of the atmosphere is found to be = that of 3986 cubic leagues of mercury; and if we consider the proportions of oxygene and azote, in volumes, in the atmosphere—their relative specific gravity—and the weight of the oxygene of the atmosphere, in reference to that of the azote (which is as 23 : 77), we shall obtain for the absolute weight of all the oxygene in the atmosphere a number equal to that of 900 cubic leagues of mercury.

Now four thousand millions of organic beings* consume in

* Since it has been found, from considerations of a physical nature, that the greater number of fishes, particularly those living at great depths, secrete instead of consuming oxygene, as some late

one hundred years (sup. 11.) 3×10^{14}, or three hundred thousand millions of pounds (marc) of oxygene (sup. 12 and 13.) A cubic *toise* of mercury weighs (sup. 7.) 205580 pounds. Therefore, 1,459,285,922 cubic toises of mercury would equal the weight of the oxygene consumed by the various causes already enumerated, in a hundred years. And as a cubic league contains about 11,860,000,000 cubic toises, the total weight of the oxygene consumed in one hundred years will be less than $\frac{1}{8}$ of a cubic league of mercury. Thus the diminution of the oxygene of the atmosphere in 100 years will be less than $\frac{1}{7200}$ of its total weight—a diminution which it is impossible to ascertain by the surest methods now employed.

Art. IV.

This is a continuation of the Review of Professor Jameson's System of Mineralogy. Second Edition.

Art. V. *Discorso sull' Uso della Mano destra a preferenza della sinistra. Par M.* Zecchinelli.

The most frequently occurring phenomena are usually those which we know the least about, and to which we pay the least attention. To what can we ascribe the generally prevalent custom of using the right in preference to the left hand? This is the problem which the author undertakes to resolve. According to his opinion it was necessary, in order to obviate a discordant mode of action which would have resulted from the right or left hand indifferently used, that one of the two should be selected, and employed generally, in preference to the other. This being once established, and of course during the earliest periods of society, the next consideration must have been the choice of the hand; and in this dilemma, mankind could not fail to discover, that the left hand, from its anatomical connection with the most vital and important parts of the animal economy, could not be the one to be pre-

experiments seem to prove, it will be necessary for Professor Prevost to make a fresh calculation, to render his present Memoir more exact.

ferred. For it must have been observed, that when the left arm is long used, or violently exercised, the left side also of the chest is put more or less in motion, and a consequent and corresponding obstacle produced not only in the free emission of the blood from the heart, but also in its progress through the aorta and its ramifications. Indeed the prevalence of the arterial system in the left side of the body renders this opinion quite plausible; and the painful sensations we experience when we agitate greatly the left arm, or attempt to run while carrying a weight in the left hand, proves, in a certain manner, the truth of Signor Zecchinelli's assertions. Dr. Odier has added some remarks to the above article.

Art. VI. *Proceedings of the Royal Academy of Sciences of Paris, &c.*

(See our last Number.)

Art. VII. *Proceedings of the Royal Society of London, from 13th of June to the 20th.*

Art. VIII. *Lettre au Profes.* Pictet *sur la Transmission de la Calorique, &c. Par M.* Carena, *Prof. de Physique de l'Academ. Royale de Turin..*

This letter contains the description of an experiment made with a view to ascertain, whether the contact of a metallic body can modify the conducting power of heat in glass. The experiment consisted in applying externally a disk of copper to one of the panes of glass of his window, during the severe winter of 1814, by which he was enabled to impede, upon that pane, the formation of those icy crystallizations which are deposited during cold nights, and which in his case had abundantly and brilliantly adhered to every other pane of glass of that window. A circumstance which tends to prove, according to Signor Carena, that the external metallic disk serves to prevent the transmission of the heat of the room through the glass. This fact, he says, must be attributed to a law of caloric as yet unknown.

Art. IX. *Lettre de Mons.* Raymond *de l'Académie de Turin sur le Photomètre de M.* Nicod.

The photometer in question was described in the fourth number of the *Bibliothèque.* It is simple in its construction, and particularly useful in its applications. Mons. Raymond having had occasion to use it, thought he remarked a slight defect, which he proposes to remedy by as slight a change in some parts of the apparatus. Our readers not being acquainted with the instrument itself, it would be needless to mention M. Raymond's proposed alteration.

AUGUST.

Art. I. *Aperçu des Progrès et de l'Etat actuel des Sciences dans les Etats Unis.*

This article is taken from the Transactions of the Literary and Philosophical Society of New York, Vol. I. 1815, where our readers may consult the original.

Art. II. *A Review of an elementary Treatise on Geometry. By Professor* Develey, *of Lausanne.*

In the present article it is said, that a Mons. *Bertrand* of that city was the *first* who restored to the science of geometry that precision and rigorous exactness, of which the ancients left us so many and fine models; that Mons. *Bertrand* is the only one who has established in an exact manner the theory of parallels; and finally, that Mons. Bertrand (of Geneva!), has published a work on geometry more complete, more exact, and certainly much more philosophical than that of Euclid! *Audistine tu unquam de Bertrando Genevensi ?*

Art. III. *Extract of a Letter from Dr.* Olbers *of Bremen, on the Comet of last Year, &c.*

This is taken from the Philosophical Magazine for July last.

Art. IV. *Recherches physiques sur l'Iode, par le Profes.* Configliacchi, *de Pavie.*

As we shall have occasion to meet with the original of this Memoir in Brongnatelli's Giornale di Fisica, we will defer till

then to give an account of its contents. It was read before the Italian Institute.

Art. V. *Quelques Réflexions sur la Constitution physique des Corps, par le Professeur* Prevost.

In reviewing Mons. Biot's Traité de Physique, the editors of the Bibliothèque observed, when speaking of the physical constitution assigned to bodies in general, by that eminent philosopher, that it was analogous to the one which Mons. Le Sage *(notre savant compatriote)* had imagined before him. Mons. Biot's work is, we dare say, by this time in the hands of most of our philosophical readers; they have, therefore, an idea of his opinion on the physical constitution in question. In order, however, that they may perceive the analogy between that opinion and the one ascribed to Le Sage, we shall transcribe the following passage from the Bibliothèque itself. *Notre savant compatriote* "représentoit les corps comme des espèces de *cages*, dont les barreaux étoient aussi des *cages*, composées de barreaux qui étoient aussi des *cages*," &c. So on in arithmetical progression. Professor Prevost's aim in the present Memoir is to develop this notion of the *similarity* of the two opinions on the subject in question.

Art. VI. *Du Charbon végétal et de sa Base métallique, par* M. *le Prof.* Dobereirer.

The substance of this Memoir has already been laid before the British public. We know not whether the experiments have been repeated by any chemist, and whether the pretended metallic nature of charcoal has been observed by any other but Professor Dobereiner.

Art. VII.

A continuation of the Review of Professor Jameson's System of Mineralogy.

Art. VIII. *Proceedings of the Royal Academy of Sciences of France.*

(See our last Number.)

Art. IX. *Proceedings of the Royal Society of London, from the 27th of June to the middle of July.*

Art. X. *Proceedings of the Royal Society of Edinburgh, for June.*

JOURNALS PUBLISHED IN FRANCE.

Journal de Physique, par M. De la Métherie.

JULY.

Art. I. *Phénomènes de Répulsion et d'Attraction sans Electricité, par* J. P. Dessaignes.

Mons. Dessaignes is one of the most zealous and indefatigable electricians of the age. His researches on the electricity of minerals have gone far beyond those of Haüy in importance; and we believe we owe to him the knowledge of this fact, that of the two electric poles of a prismatic mineral, the one having the greater number of faces is generally *positive.*

In the present Memoir the author asserts having observed the phenomena of attraction and repulsion in certain bodies, in which electricity seemed to have no part, though the phenomena themselves appeared to depend on the same fluid in which the electric power resides. These facts are accurately detailed; but we confess we could not discover the reason why the phenomena of positive and negative electricity produced, by plunging a stick of sealing wax or a glass tube into mercury, are not to be considered as common electrical phenomena. To attribute them to the fluid in which electricity resides, and to say that they are not electrical, as M. Dessaignes seems to insinuate, is, in our opinion, to play upon words, or at most to cut up or *mince* our present knowledge, limited as it is, of electricity, without any corresponding advantage. We wish, however, to speak with more respect of the last series of facts mentioned in this Memoir; and we should even be glad to see the attention of our electricians directed to them. The phenomena in this latter case seem as if produced by a fluid sometimes analogous to the magnetic; at others, of a particular nature: and it is not improbable, that by a continuation and consequent study of such observations, we should come to a better explanation of effects we are in the

habit of attributing to so many and so various causes. Mons. Dessaignes has found, that when a metallic disk, after remaining for a short time on a marble stand, is presented to an extremely sensible electrometric needle, the latter is sometimes attracted, at others repelled—and often stationary. The weather seems to influence the production of these curious effects, as well as the distance at which the disk is placed from the needle. Thus the attractive force is manifested at the distance of twenty-seven millimetres (1.02237 inches): while the repulsive force is at its maximum at eight or ten millimetres distance (.39371 inches). But the metallic are not he only substances which produce such effects under similar circumstances. M. Dessaignes has found that almost every substance he employed gave the same result with more or less intensity. When the air is cold and dry, if a metallic disk (more particularly) be exposed in the evening to the external atmosphere, and then presented, from time to time, to the electrometric needle, the latter is more or less attracted, according to the greater or less degree of cold of the air. If during this operation a current of colder air be established by the opening of a door, and directed to the disk, the phenomenon of repulsion succeeds to that of attraction. We suspect these facts, and the subsequent ones related by the author, to be greatly connected with the researches and observations of Mons. Schübler, of which we have given an abstract, in analysing the first article contained in the Bibliothèque Générale for June.

From the above results Mons. Dessaignes concludes, that when two bodies are presented to each other, a certain power is developed, under given circumstances, which is either attractive or repulsive in proportion to its intensity. It is excited by a degree of cold, which, when augmented, causes it to disappear. The same obtains in regard to heat. Mechanical pressure favours greatly the development of this power; and it manifests itself in the angular parts of the substances employed, in preference to any other. It often takes place only on the first approach of the two bodies; and must consequently be considered as the interruption of an equilibrium, which is soon after re-established.

Art. II. *Observations Météorologiques faites à l'Observatoire de Paris.*

Art. III. *Observations sur le Gaz hydrogène carboné appliqué à l'Eclairage.*

A translation of a Paper which has appeared in a former Number of our Journal.

Art. IV. *Le Cours de Géologie donné au Collège de France, par* J. C. De la Métherie.

Every one knows, that the author of the publication thus announced stands completely insulated in the midst of the republic of French savans. His notions, his various works, the manner of combating those of others—his style even, and composition, have given him an indelible character; a character, which in Europe has become synonymous with the name of the author. We will not deny that much service has been rendered to science, in general, by this indefatigable writer. But it often happens that we live too long for our reputation: it also sometimes occurs, that our reputation does not live long enough for us. Happy he who can say in time, "satis feci et non ultra progrediar."

The article before us is a review of a work written by the author of the work himself. It may be easily conjectured, that it is not an unfavourable one; and in fact, on looking over it, we find that Mons. De la Métherie has taken pains to inform us, not only that his *Cours de Géologie* is the best in the world, but that it is so, because he had already, and at different intervals, published such and such other works equally good and important to science.

Art. V. *Recherches sur la Nature de la Matière huileuse des Chimistes Hollandais, par MM.* Robiquet *et* Colin.

We have given the substance of this important Paper in our last Number. It well deserves to be wholly translated in some of our scientific journals.

Art. VI. *Observations pour servir à une Classification des Animaux, par M.* de Barbançois.

Our readers are acquainted with Delamarck's great work on philosophic zoology. The present writer approves the

general division into two classes adopted by that eminent naturalist, by which animals are considered and studied in a distinct manner, according as they possess or not that osseous arrangement, which has been denominated the vertebral column. But he objects to the subdivisions contained in that work. Those subdivisions are the following: 1. Mammifères. 2. Oiseaux. 3. Reptiles. 4. Poissons. 5. Mollusques. 6. Cirrhipèdes. 7. Annelides. 8. Crustacées. 9. Arachnides (insects without wings). 10. Insects (having wings). 11. Vers. 12. Radiaires. 13. Polypes. 14. Infusoires.

To adopt these subdivisions, the present writer thinks some alterations necessary. Man, he thinks, ought to be classed separately from mammiferous animals, from certain differences, derived from the anatomical structure, the apparent characters, and intellectual powers. The latter circumstance alone would suffice for the establishment of a *Règne moral*. Again; the reptiles he would have subdivided into two classes—the one comprehending the *scaly*, the other the *viscous* reptiles. As for the molluscæ, Mons. Barbançois is of the same opinion as Mons. Cuvier, who in a late Memoir read before the Institute, on the anatomy and structure of the sæpia, proposes to separate this order from the molluscæ, and to form a new class called *céphalopodes*. The *cirrhipédes* and the *annelides* ought to form but one class. Besides these variations, the author mentions several others, which it would be out of place here to transcribe. He gives several and some good reasons for the alterations proposed; and in general treats his subject as a man of sense. We shall, therefore, not scruple to give the following table presenting a summary view of his ideas on this interesting subject.

This is the second *projet de classification* which we lay before our readers since the commencement of our analytical labours. The first to which we alluded in our analysis of the *Bulletin de la Société Philomathique*, had all the characteristics of genius and of haste—haste, which was attributed to a fear, apparently groundless; since it is not to be presumed, that any *great* naturalist, however hostile his feelings may be, and however reasonable those feelings, would have availed himself of another person's researches in an unfair manner, and to the

exclusive advancement of his own reputation. We, however, recommend the present article in the original to the attention of all those who dedicate themselves to the study of the most perfect productions of nature.

Tableau de la Classification proposée.

			Degrès.	*Classes.*	*Sous-Class.*
Les Animaux divisés en	Vertebrés	à sang chaud	9me	Hommes - -	intelligens bornés
			8me	Mammifères -	terrestres marins
				Oiseaux - -	jambes gar. de pl. jambes dénu. de pl
		à sang froid	7me	Reptiles écailleux	avec pattes sans pattes
				Reptiles visqueux	avec queue sans queue
				Poissons - -	osseux cartilagineux
	Invertebrés	à système nerveux visible	6me	Cephalopodes -	avec sac avec coquille
				Mollusques - -	cephalés acephalés
			5me	Annelides - -	nus couverts
				Crustacés - -	entomostracés malacostracés
			4me	Arachnides - -	antennistes palpistes
				Insects à métamorp.	broyeurs suceurs
		à système nerveux invisible	3me	Vers interieurs -	intestinaux viscéraux
				Radiaires - -	échinodermes malacodermes
			2me	Polypes - -	libres aglomérés
			1me	Infusoires - -	appendiculés lisses

AUGUST.

Art. I. *Mémoire sur les Propriétés optiques de Muriate de Soude, &c. par* D. Brewster.

Translated from the Philosophical Transactions of the Royal Society of Edinburgh.

Art. II. *Des Méthodes classiques et naturelles, appliquées à la Géographie Physique, par M.* Toulozan de Saint-Martin.

Mons. Toulozan is not only a writer of memoirs on *Géographie physique*, but the historiographer of nature. Our readers may perhaps recollect a work, in three thick volumes, announced in our list of foreign publications, contained in the last Number, to which this gentleman's name was affixed, *plus* that of a friend, a Mons. Gavotz. The present essay, however, is the sole—the unassisted effort of Mons. Toulozan himself; and the second, which he makes in favour of "a vigorous system of *Physical Geography*, now proposed for the first time, this science never having had a system before." For this purpose, the author begins by borrowing a little from geology; and after having observed, that the opinions respecting the formation of primitive rocks were various, but that in regard to the secondary formations, it was agreed to consider them as the precipitate of substances previously held in solution, he comes to the very natural conclusion, that "the primitive are different from the secondary formations." This is so very clear and ingenious, that we shall not lose any time in explaining it. Unluckily for the author, not all the other conclusions, to be found in his paper, are equally convincing or intelligible. Thus, we have in vain read over, twice, the passages immediately preceding the sweeping paragraph, "*Après avoir ainsi réfuté l'opinion des Neptuniens,*" in order to discover the refuting arguments. Our researches have been unsuccessful; these arguments did not present themselves with that ease and evidence with which we had perceived the *difference* between the primitive and the secondary rocks. The same might be said of Monsieur Toulozan's *aérifère* formation, (transition rocks,) on which a good deal of his system is

founded. But, in thus becoming the advocate of *air*, for its share in the great convulsions experienced by our globe, the author's immediate aim becomes evident, or, at least, we fancy it so. Tired with the *disputes éternelles* between the partizans of *water*, and the supporters of *fire*, Mons. Toulozan, with the most benevolent intention, "*a voulu y souffler dessus.*"

The practical parts of M. Toulozan's Mémoire are not subject to the same exceptions. We recommend his geographic divisions to our readers, who will be glad to learn that a large map of the *physical globe*, in which all the regions of the earth are designated under new names, will appear at the conclusion of the present essays.

Art. III. *De l'Etat actuel de la Chimie. Par* J. C. De la Métherie.

The author asserts, that chemical theories have taken such a turn, that the most eminent professors of chemistry in France, even the youngest of them, are not *à la hauteur* of the new doctrine. How can we believe this, when we daily read of, and witness, the great progress which the numerous eminent men who cultivate chemistry in France, make in that science? We must, therefore, suspect, that in making such an assertion, Mons. De la Métherie was either ignorant of what was going on in his own country, and under his own eyes; or that, following the example of many others, he wished to raise the reputation of the *ancients* on the ruins of that of the *moderns*, particularly of his own countrymen.

In this short and emphatic epitome of the actual state of chemical knowledge, the author complains bitterly, that his labours have been neglected, that his works have been pillaged, and that no mention of either has been made by the persons who had made free with both. He more particularly insists on the circumstance of his having asserted, before any body else, that there existed some acids without oxygen. We will be more just towards him—we will acknowledge to have read his various works. But how can we believe him to be serious in his claim of priority in this respect, when, of the few acids now ascertained to be without oxygen, two onl

existed at the time of his chemical speculations; one of which, (the sulphuretted hydrogen,) was scarcely considered as an acid, and the composition of the other, (the muriatic acid,) was not yet properly understood; while the remaining ones have been but recently discovered? After all, the most considerable part of this Memoir is a reprint of Mons. Ampère's paper on a new classification of simple substances, to which we alluded in our last Number.

Art. IV. *Mémoire sur les Substances minérales dites* en Masse *qui entrent dans la Composition des Roches Volcaniques de tous les Ages. Par* L. Cordier.

This is altogether an important paper; but not of a nature to be reduced into a small compass; being, as the subject required it, of a great length. It was read before the Institute more than a year ago, and the mere substance of it was then given to the public, if we mistake not, through some of the French journals. It now appears whole, and may be considered as adding a good deal to our already abundant stock of geognostic information. In the course of some experiments made to illustrate his theory, the author had an opportunity to observe the degree of heat at which fusion takes place, in the several mineral productions, generally considered as volcanic. In these essays, the temperature was ascertained by means of Wedgewood's pyrometer. The results were the following.—

Amphybole, (black, brown, blackish-green enamel), 50° 57′ to 71°.

Feldspar, (white, or yellowish-white glass,) 71° to 94°.

Pyroxene, (bottle-green, or yellowish-green glass,) 101° to 141°.

Iron Sand, *(fer titané,)* (black tarnished enamel,) 143° to 161°.

Oligistic Iron, (black and tarnished enamel,) 189° to 204°.

Mica, (a blackish-brown glass,) 183° to 236°.

Amphygene, (white glass,) 283° to 378°.

Peridot, (a yellowish-white, and a greenish-black enamel,) 472° to 756°.

SEPTEMBER.

Art. I. *Suite des Méthodes classiques et naturelles, &c. Par Mons.* Toulozan.

We must revert to what we said above, on the subject of this gentleman's Memoir.

Art. II. *Observation sur les Avantages du* Datisca Cannabina *dans l'Art de la Teinture. Par M.* Braconnot.

The *Datisca*, bearing a flower of a rich yellow colour, is cultivated in our English gardens, under the name of bastard hemp, and, according to our present author, yields a magnificent colour, not inferior to that furnished by any other plant now employed in the art of dyeing. Mons. Braconnot first gives a general botanical description of the plant, and next details the trials made with a decoction of it, by means of several re-agents. The mode of extracting the colouring matter in question, is the following. To the decoction of the plant, add a solution of acetate of lead—a precipitate will be formed, which is composed of a vegetable acid, and a gummous substance. Decant the liquid, saturate with potash, and again add acetate of lead—the liquor becomes colourless, and a precipitate is formed of a most beautiful yellow colour, not in the least altered when it is dried and pulverized. Wash the precipitate, and decompose it by means of sulphuric acid—the colouring matter will then be easily separated. When dry, it is transparent like gum, insoluble in alcohol, but perfectly soluble in water. The latter solution is not in the least altered by acetate of lead. Nitrate of mercury occasions a precipitate—sulphate of iron gives it a deep brownish colour—alum a more vivid and intense yellow cast; while the acids in general diminish the intensity of the colour. It may be easily applied to linen, silk, and cotton, but more so to wool, by following the customary processes of art.

Mons. Braconnot's experiments were made on the female flowers of the Datisca, none of the male being at his disposal. He afterwards enters into some details respecting the cultivation

of this plant, and concludes with recommending a trial of it on a large scale.

In a note affixed to this paper, the author mentions, that a solution in water of the extract of datisca, in which aluminated wool had been boiled, gave to the latter a very brilliant yellow colour.

While he was endeavouring to separate the colouring matter from the plant in question, Mons. Braconnot mentions having observed a new substance or principle, which he considers as peculiar to vegetables, and of which he gives a superficial account.

Art. III. *Observations météorologiques faites à l'Observatoire de Paris, par M.* Bouvard.

Art. IV. *Mémoire rélatif à l'Influence de la Température et des Pressions mécaniques sur l'Intensité électrique des Métaux et sur le Changement de la Nature de leur Electricité, par* J. Ph. Dessaignes.

However disposed we might be to look upon this gentleman's labours and researches with deference, there is a limit to which this present part of our Journal must necessarily extend, and which precludes us from giving an extract of the above Memoir, forming a supplement to the one by the same author, analysed in our last Number. The length and the importance of the paper, besides, preclude all kind of analysis in the present instance.

Art. V. *Supplément au Mémoire sur la Réduction des Degrès du Thermomètre de Mercure en Degrès de Chaleur réelle, par* Honoré Flaugergues.

The title of this paper alone, will suffice to shew that we could not give an abstract of it without having first noticed the former memoirs by the same author, to which it serves as a supplement, and to which it is referred, being contained in one of the anterior numbers of the *Journal de Physique.*

Art. VI. *Mémoire sur la Communication de la Structure des Cristaux doués de la double Réfraction, &c. par M.* Brewster.

Extracted from the Philosophical Transactions of the Royal Society of London.

Art. VII. *Des Taches du Soleil.*

This is an extract of Mons. Pictet's article, for which see our account of it above.

OCTOBER.

Art. I. *Suite des Méthodes classiques et naturelles, &c. &c. par M.* Toulozan.

To those who adhere tenaciously to the old prejudices of our schools, it will occasion some amazement to read, in the present continuation of M. Toulozan's second Memoir on *Géographie physique*, that Africa is the *fifth* part of the globe, and that there is a *sixth* part besides, and for aught we know, a seventh, and so on to a dozen. Yet so it is; and we think that the author makes out his case pretty clearly.

We also learn from this continuation of the *second* Memoir, that a *third* will soon appear, which is to be followed by a *fourth*, intended to throw out some useful hints for a new geographic nomenclature, which last work will certainly be laid before the public under the title of *Systema Naturæ, Pars Geographica*, illustrated, as we had occasion to mention before, by a general map of the physical world.

Art. II. *Observations météorologiques faites à l'Observatoire de Paris, par M.* Bouvard.

Art. III. *Prodrome d'une nouvelle Distribution systématique du Règne animal, par M.* H. de Blainville.

We have already noticed this same paper in our last number; and we are rather inclined to protest against this unnecessary multiplication of copies of the same memoir, in two or three different periodical publications, by which useless repetition a delay must be occasioned in the insertion of other valuable matter.

Art. IV. *Mémoire sur la Possibilité de faire vivre des Mollusques fluviatiles dans les Eaux salées et des Mollusques marins dans les Eaux douces, considérée sous le Rapport de la Géologie, par* F. S. Beudant.

For an account of this important paper, see the analysis of the *Annales de Chimie* for May, given in our last Number.

Art. V. *Suite du Mémoire sur les Substances minérales dites en Masse, &c. &c. par M* Cordier.

See what we have said of this Memoir a little above. The present continuation contains a comparison of the mineral substances considered as non-volcanic, such as *Petrosilex, Trap,* and *Cornean rock,* with the lithoid paste of the currents of lavas of all ages. And an examination of the indetermined substances composing the volcanic scoriæ, and the vitreous lavas likewise of all ages.

Annales de Chimie et de Physique, par MM. Gay-Lussac *et* Arago.

JULY.

Art. I. *Suite du Mémoire sur la Composition des Acides phosphoriques et phosphoreux et sur leur Combinaisons avec les Bases salifiables, par* J. Berzelius.

Our readers are already acquainted with the importance and the object of this Memoir, without our detaining them further upon it.

Art. II. *Récherches sur les Lois de Dilatation des Solides, des Liquides, et des Fluides élastiques, et sur la Mesure exacte des Températures, par MM.* Dulong *et* Petit.

The public has been made acquainted with the substance of this highly interesting memoir, drawn up in a masterly manner, through the medium of an English scientific journal, some time ago; it having been read before the Institute in the month of May, 1815.

Art. III. *Mémoire sur quelques Expériences tendantes à déterminer, par la Coupellation et le Départ seulement, le Titre exact d'un Lingot contenant de l'Or, de Platine, de l'Argent, et du Cuivre, par M. Chaudet,* Assayer at the Mint.

It appears, from the author's statements, that there circulate in the trade, lingots of a quadruple alloy of gold, silver, copper, and platinum, in which the existence of the latter, either from ignorance or malice, is never acknowledged by the persons presenting them for sale. When platinum is present in a large proportion, the directions given by M. Vauquelin,

for detecting it, have hitherto enabled the common assayers to ascertain its existence; but never so accurately as to determine the precise quantity, and consequently the intrinsic value of the alloy under consideration. The continual embarrassments produced by this incertitude, induced M. Chaudet to investigate and study the point, which, notwithstanding D'Arcet's memoir on the alloys of silver and platinum, published in 1807, left a considerable chasm in the code of instructions for the assayer. Of course we cannot now be expected to enter into the details of all the experiments (ten in number) made by M. Chaudet, with a view of ascertaining the standard worth of the lingots in question, by the determination of the quantity of platina they might contain. This would extend too far for the limits of this part of our Journal. Suffice it to mention, that the author, after the account of his experiments, gives the description of his *modus operandi*, which seems quite simple and effective, for assaying the said alloys, and likewise his method for refining the lingots composed of gold, silver, copper, and platinum. This latter method consists, first, in fusing and granulating the alloy, by throwing it into water. Dissolve the metals in nitro-muriatic acid in capsules of porcelain, over a sand-bath. By this operation the silver is converted into a muriate, which being insoluble is easily separated by washing. When separated, it may easily be reduced by lime and charcoal, or carbonate of soda. Into the liquids containing a solution of copper, gold, and platinum, pour (after, however, having evaporated them to dryness and re-dissolved the mass in water) a solution of muriate of ammonia. This will precipitate the platinum under the form of a triple muriate, which may be obtained by decantation, washed, dried, and reduced by a gentle heat only. The solution of gold is next precipitated by the proto-sulphate of iron, in the metallic state, filtred, washed, and collected. And as for the copper, it may be obtained, likewise in the metallic state, by means of metallic iron.

ART. IV. *Sur quelques Phénomènes relatifs au Mode de Solution des Corps dans les Liquides et sur leur Application aux Loix de la Cristallisation, par* J. F. Daniell.

Taken from the first Number of the Journal of Science.

Art. V. *Note sur les Gaz intestinaux de l'Homme sain, par M.* Majendie.

We have already given the substance of this memoir in our preceding Number, in the account of the proceedings of the Royal Institute of France.

Art. VI. *Expériences sur le Gaz hydrogène phosphoré, par* M. T. Thomson.

Translated from the Annals of Philosophy for August, 1816.

Art. VII. *Extrait des Séances de l'Académie des Sciences for July,*

Art. VIII. *Observations sur quelques Combinaisons de l'Azote avec l'Oxygène, par M.* Dulong.

" Chemistry," says the author, " exhibits combinations so difficult to isolate, and the production of which is accompanied by circumstances so complicated, that the most expert and accurate observers obtain a knowledge of their properties only after long efforts and successive labouring, in which, before attaining the truth, they, in a manner, expunge all kinds of existing errors." We had given in our last Number, a simple abstract of the paper now before us, as it had been read at the Royal Institute in the month of September, (see our account of the proceedings of the Academy for that month) and we should now have presented our readers with a more circumstantial detail of it, but that we perceive a complete translation has just been inserted in one of our contemporary publications, to which we must refer them.

Art. IX. *Météorological Observations* for July.

AUGUST.

Art. I. A Continuation of the Memoir of Berzelius on *the Composition of phosphoric and phosphorous Acids, and their combination. with different bases.*

Art. II. *Récherches chimiques sur les Corps gras et particulièrement sur leurs Combinaisons avec les Alcalis, 6me. Mem. par Mons.* Chevreul.

We had led our readers to expect this publication, by what

we had occasion to say upon it in our last Number. Mons. Chevreul, in the present memoir, after having recalled the subject of the former five papers forming part of his series of researches on the *Corps gras*, passes to the examination of the *human* fat, as well as of that of *mutton*, *beef*, *jaguar*, and *goose*. In a seventh memoir, not yet published, the Author proposes to study the oil of *Delphinus globiceps*, and the *fish oil* of commerce, and in an eighth, *butter* and *buttiric acid*. The present memoir presents us with the several properties which may be discovered in the fat substances above enumerated, without decomposing them, such as their colour, their fluidity at different temperatures, their smell, and their solubility in alcohol. Next we have the changes produced by potash on these substances, with an examination of the soaps resulting from a combination with it. The *Margaric* and the *Oleic* acids obtained from these soaps are afterwards compared to similar acids formed by means of the fat of pork. And in further detailing the analysis of the fat substances, forming the subject of the present memoir, by means of alcohol, we are presented with an account of the *Stearine* and *Elaïne*, separated from the soaps in question during that operation.

Art. III. and Art. IV. are taken from the Annals of Philosophy;—they relate to the late Mr. Howard's mode of refining sugar, and to M. Donavan's memoir relative to the impurities of hydrogene as obtained by the ordinary processes.

Art. V. *Rélation de la Découverte d'une Masse de Fer natif dans le Bresil, &c.*

This is the paper of Mr. Mornay, with notes and experiments by Doctor Wollaston.

Art. VI. *Observations physiques et météorologiques faites dans les Carpathes, par* M. Wahlenberg.

M. Wahlenberg, a Swedish botanist of much eminence, is the Humboldt of Europe with respect to the geography of plants. In the space of five years he has published no less than three esteemed works on this subject; and he has done

with regard to the mountains of our Continent, what the latter illustrious naturalist did respecting the Andes of South America. The present memoir gives an account of the Carpathian Mountains in Hungary, and is taken from the *Flora Carpathorum* published by the Author. The plains of Hungary and Transylvania are the most extensive in Europe. The mean height of the water of the Danube near Vienna is only 135. metres (442,5 feet) above the level of the sea. From Vienna to Presbourg, the river has an inclination of about 35.4 metres, (116 feet) and from Presbourg to Pesth 30.9 metres (103 feet,) But to give a more accurate idea of the inclination of the Danube, it will be sufficient to recollect the comparative heights of Ratisbon, Lintz, Vienna, Presbourg, Raab, and Pesth; which are 359 metres; 224 m.; 134 m.; 117 m.; 82 m.; 70 m.; The mean elevation of the immense plains of Hungary, distant 100 leagues from the coasts, is 68 metres; (225 feet) that is 468 metres less than the plains of Bavaria, the rivers of which flow likewise towards the Danube. This depression of the land in the east part of Europe is most remarkable in Hungary, Poland, and the interior of Russia. The plains of Pesth extend themselves to the foot of the Scépusian Carpathian mountains, and by their reverberation greatly contribute to give to these mountains, placed in a latitude of 49° 10′, a vegetative force equal to that of the Pyrenees and the Piedmontese Alps.

The Author next proceeds to detail his observations on the temperature and the salubrity of the air, made in various parts of the Carpathian mountains—and likewise the internal temperature of the earth at different places. These series of observations serve to establish a parallel between the two, as applied to plains, and elevated grounds in general.

Art. VII. *Sur des Eruptions volcaniques de l'Ile de Java et les Iles voisines.*

This is an extract from a paper inserted in No. II. of our Journal, with some additions by the translator.

Art. VIII.

Extract from the Philosophical Transactions, of Dr. Wollaston's Memoir on the property of diamond in cutting glass.

ART. IX. *Extract from Foreign and Domestic Journals.*

(See our own extracts on the same subject.)

ART. X. *Note sur la Pompe à vapeur, par M.* Gay Lussac.

This note contains an ingenious suggestion to the constructors of steam engines, for obtaining water at an elevated temperature, in those machines, without injuring their effect, and with economy. The author proposes his method for procuring this advantage, with diffidence, and without being positive as to its novelty, and ultimate good effect.

His method, in a few words, consists in having two, instead of one condenser only. The one destined to begin the condensation of vapour, and to supply the hot water; while the other completes the operation. Their reciprocal play must be successive; and in conveniently regulating the quantity of water injected into each condenser, a temperature of between 25 and 100 degrees (centigrade) might easily be obtained.

ART. XI. *Analysis of certain Minerals by* Gahn *and* Berzelius, *from the Swedish.*

Something of this kind has been given by Doctor Thomson in his Annals of Philosophy for September last.

ART. XII. *Proceedings of the Royal Academy of Sciences during September.*

(See our last Number.)

ART. XIII. and XIV. are from the Annals of Philosophy, and the Journal of Science—containing an account of Dr. Clarke's experiments,—and a description of a Lake of Soda in South America, by M. Palacio Faxar.

ART. XV. *Meteorological Observations for* August.

SEPTEMBER.

This Number is but just published, (December) and in importance is equal to any other since the new Series has begun under the sole management of the present very assiduous and

indefatigable Editors. Indeed a very great improvement in the Journal, altogether, has taken place under its present form; and we must hope, for the sake of science and scientific men, that no untimely interference of Government, or faint-heartedness of booksellers and coadjutors, will check its progress and circulation.

Art. I. *Expériences rélatives à la Fabrication des Savons durs, par M.* Colin.

After a short review of the researches of Pelletier, D'Arcet, and Le Lievre on the fabrication of soap, and of the more recent and important labours of Chevreul, and Braconnot, the Author gives a detailed account of twenty-four experiments made by himself, and directed to the same point—but chiefly intended to rectify certain errors committed by his predecessors, on saponification; and to illustrate certain obscure facts, at the same time that he establishes some more general and accurate principles on the subject. In these experiments M. Colin employed different oils, and various alcaline preparations, and ultimately tried the action of common salt on soaps. On the results he has obtained, the author makes several interesting observations, all of which he details with accuracy. Amongst them we shall only notice the most striking. M. Colin thinks that he has ascertained, 1st. that the simultaneous action of air and aqueous vapour on oils, destroys their smell, renders them colourless, disposes them to saponification, and above all, gives rise to the remarkable phenomenon of a separation taking place between a highly saponifiable part, and another which is so in an inferior degree. But this separation demands either a treatment by sulphuric acid, or a lowering of the temperature; 2d. that the liquid part of oils may be obtained by a well managed saponification; 3d. that water is absolutely necessary in the formation of soap; 4th. that common salt has this advantage over the soda of commerce, that it will harden to any degree the soap, in the fabrication of which it has been employed; 5th. that in augmenting the quantity of alcali, an obstacle is raised to the whiteness of the soap; 6th. that lime is a most important

ingredient for the fabrication of soap; 7th. that salts of soda decompose soaps having other bases; 8th. that solid, and sufficiently hard soaps for the purpose of washing, may be obtained with every kind of oil; and lastly, that the best and the finest soaps, and the most difficultly altered, are those which have been made with oils not previously submitted to the action of any other ponderable body.

Art. II. *Supplément pour l'Eclaircissement de plusieurs Objets dans la Dissertation de Mons. Berzelius.*

This supplement contains several other analyses of minerals by the above mentioned eminent chemist. In a first article the gadolinite of Finbo and Broddbo are analysed; they do not seem to differ much, as the silica, and yttria are in the same proportion in both, namely, 25 80 for the silica and 45 + for the yttria. The remainder is made up with 16 + protoxide of cerium and 10 + protoxide of iron. M. Berzelius never having been able to obtain the yttria perfectly white, suspects that the white precipitate obtained by ammonia in the analyses of Klaproth and Vauquelin was not pure yttria, but a sulphate of yttria; but the editors of the "Annales" very justly observe, that the latter chemist having obtained his precipitate from a nitric solution, Berzelius's supposition cannot hold good with regard to it. The reason given for this supposition by the author, is that he himself has never been able to obtain the yttria completely free from the oxide of cerium; and that the only method which succeeded with him, was a decomposition of the triple sulphate of potash and yttria mixed with that of cerium; in washing the precipitate and dissolving it in either nitric or muriatic acid, and precipitating the solution by a sub-carbonate of ammonia in excess in order to redissolve the yttria. After separating the precipitate, which contains much oxide of cerium, the solution is heated, and by the disengagement of the carbonate of ammonia, the yttria is separated almost white. The second Article contains an analysis of the hitherto known Fluosiliciates, particularly the topaz, the *pyrophysalithe*, and the pycnite.

Art. III. *Lettre de* M. E. Clarke, *Professeur de Minéralogie, &c. au Rédacteur du Journal de l'Institution Royale. &c. &c.*

This is a translation, *in toto*, of Dr. Clarke's Letter to Mr. Brande, giving an account of his experiments on metallic oxides, and other mineral substances. The subject seems to have attracted a considerable attention on the continent.

Art. IV. *Mémoire sur les Propriétés nutritives des Substances qui ne contiennent pas d'Azote. Par* M. F. Majendie.

We have given the spirit and substance, and that is all we could do, of this paper, in our last Number, when speaking of the proceedings of the Royal Academy of Sciences, before which it was read. M. Majendie, however, now objects to our note to his paper; and his objections are detailed, at full length, in the article of the "Annales" we are now reviewing. The fact is, that we consider the whole information contained in his paper, as extremely futile, and leading to no possible, practical, or useful result whatever. Much less are we inclined to view the scanty, insulated facts, founded on ill-devised experiments, as sufficient to authorise him to draw any, even the most superficial, inference, which, if passed unnoticed by professional men, might induce him to adopt it, in his next volume of Physiology, as the basis of some incorrect generalization, of which he has, now and then, given us some instances. But we are not fond of declaiming, without supporting our assertions with the semblance, at least, of reason. Why undertake the experiments on the "mouvement nutritif" on carnivorous, rather than herbivorous animals? What practical result, in the least useful, can be derived from *suddenly* and *completely* changing the usual diet of a carnivorous animal? and submitting it to live on sugar, butter, or gum!! What can we possibly conclude from the subsequent extinction of those poor animals, but that they were starved to death "novo modo?" And yet Professor Majendie affects to be astonished at it; or rather, attributes it to the mere want of azote in the substances given! We really wish him too well to be anxious to see a repetition of his experiments made upon

himself; but if, from the above conclusion, we are to argue, that the presence of azote would have saved the animals from starvation, we advise him to prosecute his researches—but to do so upon graminivorous animals; and above all, to try the effect of a gradual, instead of a sudden and violent change in their diet.

But M. Majendie may object to us, that his intention was merely to prove, that the presence of azote in animals, is due to the aliments containing that principle.* Granted for a moment. How much would the knowledge of such a fact advance us in the science of the "*mouvement nutritif,*" more than the experiments on the coloration of bones by madder, or any other similar experiments, have done—namely, very little? We ought, therefore, to be very careful, when the itch of experiment assails us, how we suffer ourselves to be pushed on by fanciful theories, that have "neither habitation nor a name."

One word more, and we have done. M. Majendie, it seems, has been at the trouble of rummaging amongst the English Medical Journals, to find, that Dr. Stark had submitted himself to the use of sugar for a month; and he adds, on the authority of a nameless person, that the Doctor died in consequence of it. To this assertion, we answer by another: that we know him to have died from no such cause. But even had *he* fallen to victim to this sudden change of diet, what would his case prove in favour of the Professor's theory?

Art. V. *Rapport fait à l'Academie de Sciences le* 14 *Octobre* 1816, *sur un Mémoire de M.* Hachette, *rélatif à l'Ecoulement des Fluides par des Orifices en mince parois, et par des Ajutages cylindriques ou coniques.*

(See our account of the proceedings of the Academy of Sciences, in our last Number). Mons. Cauchy was the reporter, and the Commissioners, while approving the memoir

* M. Majendie seems to insinuate, that the affirmative obtains in this case, because, in examining the secretions and excretions of the starved animals, M. Chevreul and himself, could discover a trifling proportion only of azote; but why not analyse the muscular fibre of the animals after death?

generally, proposed several important problems for solution, to the author.

Art. VI. *Déscription d'un Thermomètre propre à indiquer des* MAXIMA *ou des* MINIMA *de Température. Par M.* G. Lussac.

This is an extremely ingenious devise, but one which, for want of a plate, we cannot well describe; and time is wanting for the execution of the necessary figures. The apparatus is chiefly calculated for ascertaining the temperature of lakes and seas, taken at very great depths.

Art. VII. *Sur la Longueur des Pendules à Secondes, Par M.* Laplace.

For an account of this note, see the proceedings of the Institute.

Art. VIII. *Extraits de Journaux, &c. Bibliothèque Universelle, Juillet* 1816.

We have already given, in a former part of this Number, a similar account of the Journals in question. But in the "Annales," we find something more interesting, in the shape of two notes to the *Bibliothèque Universelle,* respecting the "Spots in the Sun." In the first note, there is a curious account relative to the temperature of the rain fallen in 1815, compared with that of the succeeding year, in Paris. In 1815, the mean temperature of the first ten months was = + 12°,0, (centig.) In 1816 = + 10°,5. In 1815, the quantity of rain collected during the first ten months, was = 36 cent. 77. In 1816, on the contrary, = 43 c. 47. The difference, therefore, in old measures, corresponded to two inches, five lines, and seven tenths. The comparison goes on further, and, it is remarked, that in 1815, from January to October inclusive, there had been 127 days of rain: in 1816, *eight* days more, during the same space of time. In 1815, it rained twelve times in July: in 1816, the same month presented but *five* days without rain. The second note contains some reflections on the endeavours made by several astronomers, to shew the little connection existing between the spots lately observed in

the Sun, and the variations of temperature which we experience. The whole note is worthy of the masterly hand which has traced it; and we need not be prophets to guess whose hand it is. Let those who are too fond of, and too hasty in, generalizations, read this note, and profit by the advice there indirectly given by one, whose name is marching rapidly towards immortality.

Art. IX. *Observations des Redacteurs sur un Article du* JOURNAL DE L'INSTITUTION ROYALE DE LONDRES.

We may now consider our Publication, as the French would call it, *comme un Journal bien établi.* We have attracted the attention, and merited the animadversions, of men justly esteemed for their talents, their discoveries, and their great proficiency in the cultivation of science. This circumstance must be particularly flattering to us; and the urbanity, with which the reflections of our opponents are conveyed to us, renders our lot exceedingly bearable, and our task of replying to them, not altogether difficult. Of course we cannot be expected to shew much *esprit* in what we shall have to say. We make no profession of it: *ce n'est pas chez* nous, *qu'on en trouve*; so that we must content ourselves with replying in homely phrases. We only wish that this Article had been entirely our property, as its title would seem to indicate: that is, we wish we had been made responsible for our own faults only; and that our supposed offence had been the only subject of the present observations of the Editors—and this for the good reason, that we are not fond of meddling with the affairs of others, when we have our own to mind. If, indeed, we have brought forward, in our last Number, while speaking of the *Piles seches Voltaiques,* (page 161,) a charge against the French in general, (and not against the Editors of the "Annales" in particular, as they appear to understand it, from not paying sufficient attention to the language,) of an over anxiety in putting forth a claim of priority in favour of their own countrymen, in cases of new discoveries or inventions; it does not necessarily follow that we are to answer for the observations of an English critic, who may have taken into

his head, eight or ten years ago, to find fault with the French mathematicians, for having adopted the trigonometrical notation of large A's and small b's, from an English writer without acknowledging it.* A similar feeling of esteem for the Editors of the *Annales*, to that expressed by them for us, has induced us to notice their answer to our observations, which we in general shall abstain from, lest we should involve ourselves in controversy, seldom or never productive of any useful results to science.

Our assertion that Voltaic piles made with *colle*, which gradually loses *son humidité* cannot be considered as *dry* piles, is granted to us, and thus far we were right. But we forgot

* That our readers may understand the above allusion, it will be necessary to say, that *MM. les Redacteurs* in order to retort the accusation we brought against the French in general, of an over anxiety in claiming the priority of discoveries in favour of their countrymen —have been at the trouble of finding out a *reclamation* of this kind, made sometime ago by a critic in the Quarterly Review, on an insignificant subject, which *reclamation* they have translated and given in by the present Number, accompanied the following observations.

" M. Le Redacteur insinue que nous ne saurions écrire un article *quelconque* (a mistake for want of a sufficient knowledge of the language) sans y placer une reclamation en faveur des savans Français : ainsi, pour qu'il nous pardonne celle que nous venons de lui adresser, nous allons extraire textuellement du tome V. du Quarterly Review, page 344, un passage qui lui montrera que quelques-uns de ses compatriotes ne sont pas en reste à cet égard, puisqu'il *reclament* ce que personne en France *n'a, n'a eu, ni aura* l'envie de leur contester (they might have added *ainsi soit-il.*)

Here is the passage in question. " The mode of designating the angles of triangles, by the capital letters A, B, C, and their opposite respective sides by the same letters, under another form, a, b, c, was invented by an Englishman, and published by Gardiner, in the introduction to his Logarithmical Tables, about sixty years ago. These tables were in much general use on the Continent, and a new edition of them was published at Avignon in 1770. The French mathematicians soon perceived the advantages of this improvement, and with their usual generosity, adopted, it, making us, at the same time, believe, that it was due to them." (We translate from the French quotation).

those constructed by the said Messrs. Hachette and Desormes, with *varnish,* which were described in a memoir read at the Institute in 1803; but never published until 1809; (the year in which De Luc published his invention, and we suspect some *months* afterwards) when they were mentioned in the *Programmes de Physique, par* M. Hachette. These piles the editors consider, as being *dry* enough to stand with those of De Luc and Zamboni, and consequently to bear away the palm of priority from the two latter. But we deny the conclusion *in toto,* and put it fairly to the editors and to our readers, and those of the *Annales de Chimie,* in general, to say whether Messrs. Hachette and Desormes' piles are in the least similar to those of De Luc and Zamboni, either in their principle, their construction, their nature, their application, or their effects. Can they, above all, be considered as like those of Zamboni, in the composition of which we have only zinc (with a little tin) and an oxide of manganese,* between which a disk of paper, previously dried in a hot oven, is interposed?

We shall always feel the greatest deference for all that foreign *Savans* do in behalf of science; and therefore have little apprehension as to the observations which may be made in Germany, on our mode of combating facts, by mere assertions. We, however, thank the editors for their kind concern for us; and while we beg them to point out in what part of the article in question, we have made any *assertion* devoid of *all foundation;* we shall also feel much obliged to them to explain to us in what the numerous papers written by MM. Heinrich, Schübler, and Schweiger (whom they accuse us of treating too severely) are in the least important or instructive, as far only, as they relate to the dry Voltaic piles of De Luc and Zamboni.

As to our own experiments on Zamboni's pile, on which MM. les Redacteurs have been so *pointed,* we should not have mentioned them in the article in question, had we not read in the " Annales" of the *impuissance* of the dry piles, *pour produire*

* By a letter received from Zamboni last year, we are informed that the oil or honey are no longer employed in the apparatus.

des effets chimiques; an assertion which we were simple enough to take *à la lettre*, and therefore contradicted it, by mentioning the result of our own experiments. We acknowledge the incomparable good luck which our French brethren have, of being continually before us, even in trifles, and therefore are not astonished that the editors should have immediately found out that our experiments, insignificant as they are, had been made before in France. Still we will venture, but with the greatest submission, to suggest to *MM. les Redacteurs*, that in the parallel they have made of our experiments with those previously executed by the French, they forgot some trifling difference, which may yet (unless a further ransacking of the whole collection of the French scientific journals should prove again *unlucky* for us) leave us a small chance of *originality*. We allude, 1. To our assertion, in *opposition* to what the French and Germans have said, that the dry pile can not be considered as a hygrometrical instrument. 2d. To the regularity of the oscillations of the pendulum, observed by us from the first moment in which it was put in motion, till it ceased to vibrate in consequence of the disappearance of the oxygene of the air; and 3dly and lastly, To the phenomenon we have remarked of the said pendulum being slowly attracted (at the distance of three inches) to the positive pole, the instant a proper supply of air was cautiously introduced into the apparatus, a phenomenon which being purely *electrical*, cannot be fairly compared with that of the decomposition of water recommencing under similar circumstances, as mentioned by the editors, and must therefore be considered as perfectly distinct, and recorded for the first time by us. Still we do not mean to attach much importance to these observations.

We shall never decline taking up the gauntlet which such eminent men as the editors of the Annales may choose to throw at us; persuaded, that defeated or conquerors, we shall alike derive much benefit from the contest. We shall always hope, however, to keep our temper, and above all, to avoid personality.

Art. X. *Extrait des Séances de l'Academie, mois de Septembre.*

Art. XI. *Observations sur la Combinaison des Métaux avec le Soufre, par M.* de Moutizon.

We shall insert in the next Number a translation of this short but interesting paper.

Art. XII. *Sur la Température de la Mer et des Animaux qui y vivent, et sur celle de l'Air.*

This is an extract from the second volume of Freycinet's Voyage, so often alluded to in our present Number, with the additional observation of Dr. Davy on the same subject, published in the last Number of this Journal.

*** We are sorry to be under the necessity of here breaking off our account of foreign journals, which will be resumed in the next Number. The importance of their contents renders us unwilling to abridge too much.

Art. XXII. Evans's *Account of Excursions beyond the Blue Mountains in New South Wales.*

In the year 1813 and beginning of 1814, Mr. George William Evans, Deputy Surveyor of Lands at Sydney, for the first time explored a considerable extent of country to the westward of the Blue Mountains. The tract of land hitherto occupied by the colonists of N. S. Wales is very limited, extending along the eastern coast to the north and south of Port Jackson only 80 miles, and westward, about 40 miles to the foot of the chain of mountains in the interior, which form the western boundary: it is singular that in the twenty-five years, which the colony has been established no one of the settlement had been induced to explore the passage over these mountains. Two attempts were formerly made, one by Mr. Bass, and the other by Mr. Caley, both of which failed. The first passage over the most difficult and rugged part of these mountains was effected by Messrs. Blanland, Wentworth, and Lawson. The present Governor

Mac Quarrie, soon after his arrival at the colony, availing himself of the facilities afforded by the discoveries of these three gentlemen, determined to encourage the attempt to find a passage to the western country, and in Nov. 1813, Mr. Evans was entrusted with the accomplishment of this object. The result of this journey has been long before the public. The favourable account of this gentleman induced the governor to cause a road to be constructed for the passage and conveyance of cattle and provisions to the interior; this road, after great exertions and labour, was completed, under the directions of William Cox, Esq. and on the 25th of April 1815, the Governor and his suite commenced an excursion over the Blue Mountains by the new road. The early part of the journey was found to present fewer difficulties than were expected. At a distance, however, of about twenty miles the country changes, being rocky and mountainous, and extremely rugged. The views on the summit of the western mountains, are described as very beautiful, and the scenery of the glens and passes are very grand and romantic. Fifty six miles in the interior, two streams unite in a valley, forming a river, called by the Governor, Cox's river, which empties itself into the river Nepean, and it is conjectured from the nature of the country through which it passes that it must be one of the principal causes of the floods which have been occasionally felt on the banks of the Hawkesbury, into which the Nepean discharges itself. Westward of Cox's river the country becomes hilly, but is generally open forest land, and good pasturage: a range of lofty hills and narrow vallies alternately form the country from Cox's river to Fish river. A distance of 16 miles from thence to Sidmouth valley the country continues hilly, affording good pasturage; at the valley, the land is level and for the first time unincumbered with trees; the country is agaiu hilly to Campbell's river (13 miles), when it exhibits an open and extensive view of rising grounds and fertile plains. Judging from the height of the banks, this river must be on some occasions of very considerable magnitude, but the great drought which had prevailed at the time of the Governor's excursion for the three preceding years, had reduced the river so that it then had the appearance of a chain of ponds; the soil on

its banks was very rich. Seven miles from the bridge over Campbell's river, Bathurst plains open to the view, presenting a rich tract of eleven miles in length, bounded by rising hills thinly wooded. The Mac Quarrie river, which is formed by the fountain of the Fish and Campbell rivers, takes a winding course through the plains. On the twelfth day the Governor arrived at these plains (140 miles distant from Sydney,) and remained a week, making excursions in the surroundiug country, and whilst there, fixed on a site for the erection of a town (Bathurst) at a future period. The excursions whilst at Bathurst did not exceed 22 miles in a S. W. direction. The country was found generally fertile and well adapted to the purposes of agriculture; within ten miles of Bathurst there are not less than 50,000 acres of land clear of timber, one half of which, at least, is excellent soil. The timber to the westward is inferior to that of the northern colony. Coal and lime-stone were discovered; game and fish abundant. The foregoing account of the Governor's excursion reached this country some time since; but the Governor, whilst at Bathurst, desirous to make further discoveries of the country to the west, instructed Mr. Evans to proceed, and pursue his discoveries as far westward as the means of carrying provisions and the nature of the country would permit. The result of this excursion by Mr. Evans has very lately reached this country; and the following is a brief account extracted from the

Journal of that Gentleman.

On the 13th of May, 1815, Mr. Evans commenced his tour of discovery, and on the 2d of June, finding his provisions would not enable him to proceed further, he began to retrace his course back to Bathurst, where he arrived on the 12th, having been absent thirty-one days. In the course of this tour he travelled over a vast number of rich and fertile vallies, with successions of hills well covered with good timber, chiefly the stringy bark and the pine, and the whole country abounding with ponds and gullies of fine water; he also fell in with a large river, which he conceives would become navigable for boats at the distance of a few days travelling along its banks:

from its course he conjectures that it must join its waters with those of the Mac Quarrie river; and little doubt, it is observed, *can be entertained, that their joint streams must form a navigable river of very considerable size.* At a distance of about sixty miles from Bathurst, Mr. Evans discovered a number of hills, the points of which ended in perpendicular heads, from thirty to forty feet high, of pure lime-stone of a misty gray colour.—At this place, and also throughout the general course of the journey, kangaroos, emues, ducks, &c. were seen in great numbers, and the new river, to which Mr. Evans gave the name of the *Lachlan*, abounds with fish. In the course of this tour, Mr. Evans also discovered a substance which he describes as possessing much of the sweetness and flavour of manna, but totally different in its appearance, being very white, and having a roundish irregular surface, not unlike the rough outside of confectioner's comfits, and of the size of the largest hail-stone. Where this substance was found most plentiful, kangaroos were seen, in immense flocks, and wild fowl equally abundant.

The natives appeared more numerous than at Bathurst; but so very wild, and apparently so much alarmed at the sight of white men, that he could not induce them to come near, or to hold any intercourse whatever with him.

At the termination of the tour, Mr. Evans saw a good level country, of a most interesting appearance, and a very rich soil; and conceives that there is no barrier to prevent the travelling farther westward to almost any extent that could be desired. He states that the distance travelled by him on this occasion, *was* 142 *measured out miles;* which, *with digressions to the southward, made the total distance* 155 *miles from Bathurst:*—He adds, at the same time, that having taken *a more direct line back to Bathurst than that by which he left it, he made the distance then only* 115 *miles,** and observes, that a

* The exact course taken by Mr. Evans is not very distinctly stated; plans, however, of the route, both of the Governor and Mr. Evans have been forwarded to the office of the Secretary of the Colonial Department, which we hope at a future period we may be able to lay before our readers.

good road may be made all that length without any considerable difficulty, there not being more than three hills which may not be avoided.

From the entire tenor of Mr. Evans's narrative, it appears that the country over which he passed has even exceeded the country leading to and surrounding Bathurst, in richness, fertility, and all the other valuable objects for the sustenance of a numerous population. To the foregoing account, the Governor had added some particulars omitted in his own tour.

When he arrived at Bathurst, he found there three native men and six children, standing with a working party: they appeared much alarmed, particularly at the horses—but this soon ceased, and they became quite familiar. Frequently during the stay at Bathurst, small parties of men and boys came in. They were in appearance very like those of Sydney, though rather better looking and stronger made; some of them were blind of one eye, though not always on the same side.—Their language being altogether dissimilar to that of the natives of Sydney, it was impossible to learn whether their being thus blinded was the result of any established custom, or accidental.

These men were covered with skins of different animals, neatly sewed together, and wore the fur side inwards; on the outer, or skin side, they had curious devices wrought. They seemed to be perfectly harmless and inoffensive, and by no means warlike or savage, few of them having any weapons whatever with them, but merely a stone axe, which they use for cutting steps for themselves to climb up trees by, in pursuit of the little animals which they live upon.

These natives never brought any of their females with them on their visits to Bathurst.

Art. XXIII *Proceedings of the Royal Society of London.*

On Thursday the 7th of November, the Members of the Royal Society resumed their sittings, after the long vacation.

A paper was communicated by Sir Everard Home, containing an account of the circulation of the blood in the Lumbricus

marinus, and of the difference between it and that of other molluscæ. The Lumbricus marinus has a circulation peculiar to itself, the centre of which is situated in the middle line of the belly, and though very small, must be regarded as the heart—it receives the blood from two separate auricles, one on each side of the back, and also from a vessel from the head. The blood passes from the heart into an artery descending to the tail, and vessels are sent off from it in pairs to the external gills. The branches going to the upper gills are contorted, those supplying the lower go to them in straight lines; the blood is thence received by a vein on the back of the animal, and by two veins on its sides, which swell into the auricles above mentioned. In the Lumbricus terrestris there is no centre of circulation. An artery runs along the belly, and a vein along the back, from which all the other vessels branch off, and these two great trunks communicate laterally by five pairs of reservoirs which receive the venous blood, and empty it into the artery. These, Sir Everard says, may be called auricles. The blood is aerated by vesicles communicating with the venal trunk. It is remarked that the Sepia having three hearts, has been supposed to bear no resemblance to other animals; but the author points out its analogy in regard to circulation, to the Teredo, the blood being brought to two auricles and thence passing through one ventricle.

The Paper concluded with a comparative view of the sanguiferous systems of the Teredo, the Sepia, the Lumbricus marinus, and the Lumbricus terrestris.

Thursday, November 14th, a paper was communicated on the Hirudo vulgaris, or leech of rivulets, by Dr. Johnstone. The author has adopted the specific name Vulgaris, instead of Octoculata employed by Linnæus, because the Hirudo tessulata has also eight eyes. This leech is hermaphrodite, and oviparous, its eggs being contained in a small capsule which the animal throws off, and from which the young make their escape at variable periods.

Thursday, Nov. 21st. Dr. Wilson Philip communicated a paper on the effects of Galvanism, in curing asthmatic dyspnœa. The plan proposed consists in applying to the sternum and

spine a piece of tin foil, and connecting these pieces with a Galvanic battery of 8 to 16 four-inch plates, rendered active by muriatic acid. The benefit is immediate. In spasmodic asthma, Dr. Philip derived no advantage from this plan of treatment.

Nov. 30. The Society held the Anniversary Meeting, for the Election of Officers for the year ensuing, which were as follows:

PRESIDENT. The Right Honourable Sir Joseph Banks, Bart. G. C. B.

SECRETARIES.

William Thomas Brande, Esq. (in the room of Dr. Wollaston, who resigned.)
Taylor Combe, Esq.

FOREIGN SECRETARY. Thomas Young, M. D.

COUNCIL.

Rt. Hon. Sir Jos. Banks, Bart.
John Barrow, Esq.
William Thos. Brande, Esq.
Samuel Goodenough, Lord Bishop of Carlisle.
John George Children, Esq.
Taylor Combe, Esq.
John Wilson Croker, Esq.
Sir Humphry Davy, Knt.
Sir Everard Home, Bart.
Charles König, Esq.
Samuel Lysons, Esq.
Alexander MacLeay, Esq.
Alexander Marcet, M. D.
George, Earl of Morton.
Colonel William Mudge
William Hasledine Pepys, Esq.
John Pond, Esq.
Earl Spencer.
Sir John Thos. Stanley, Bart.
Dr. Wollaston.
Dr. Young.

Art. XXIV. *Proceedings of the Royal Society of Edinburgh.*

November 17th. A Letter from Professor Playfair to James Jardine, Esq. Civil Engineer, was read. It contained an account of some appearances on the sides of the mountains in Switzerland, which Mr. Playfair considered as analogous to the parrallel roads of Glenroy in Scotland. These appearances were seen in

the Vallais near Brieg, and consisted of lines on the sides of the hills, extending for several miles, and nearly horizontal. They are generally marked with a more luxuriant vegetation, and often with the appearance of a road. There were often two of these lines, one at a considerable distance below the other, and in some instances three. Mr. P. found upon enquiry, that they were formed for the purposes of irrigation, and were a kind of aqueduct, by which the streams that descended over the face of the mountains are conveyed laterally to a great distance. Hence he supposes that the parallel roads of Glenroy may have had a similar origin, and this idea seems to be confirmed by the fact, that one of the roads in Glenroy sets off at the head of the valley from a marsh or spring, which forms one of the sources of the Roy.

At the same meeting, a communication from Dr. Brewster was read " on the effects of mechanical pressure in communicating double refraction to regularly crystallized bodies." When polarised light is transmitted along the axes of crystals, such as beryl, calcareous spar, and quartz, both the polarising force and the force of double refraction vanish, and their forces increase with the square of the line of the angle which the polarised ray forms with the axis. When the polarizing force is so weak as to produce tints within the limits of Newton's scale, Dr. B. found that the application of compressing and dilating forces was capable either of increasing or diminishing the polarising force, and the force of double refraction, according to the manner in which they are applied, and of communicating the same forces to the crystal, when the ray is exactly parallel to the axis. These experiments were made with calcareous spar and rock crystal. Dr. Brewster also found that the forces of double refraction and polarisation could be excited in minerals by the transmission of heat in the same manner as in plates of glass. The effect is, however, less marked on account of the rapidity with which heat is communicated through minerals.

Dec. 2d. A communication from Mr. Bald, Civil Engineer, was read. It contained an account of some experiments which he had made in Ayrshire, with the safety lamp of Sir Humphry Davy; the results proved, in a striking manner, the security which is derived from this valuable invention.

Dec. 16. A communication was read by Mr. Bonar, containing observations on the filiation of the various languages spoken in the eastern parts of India, and their affinity with the Sanscrit and Chinese; transmitted by Messrs. Carey, Marshman, and Ward, missionaries employed under the Baptist Society.

At the same meeting, a paper by Dr. Brewster was read, containing the results of a very extensive series of experiments on the action of regularly crystallised bodies upon light. From these experiments Dr. Brewster has been led to the determination of all the laws by which the phenomena are regulated, and has been enabled to compose formulæ by which the tints, and the direction of the axis of the particles of light, may in every case be calculated a priori. The law of double refraction investigated by La Place, and the laws of the polarising force deduced by M. Biot were shewn to be merely cases of laws of much greater extent and generality, being applicable only to two or three crystals, while those investigated by Dr. Brewster are applicable to the vast variety of crystallized bodies which exist in nature.

Art. XXV. *Miscellaneous Intelligence.*

Report on some Experiments made with compressed Oxygene and Hydrogene, in the Laboratory of the Royal Institution.

The results of the decomposition of the earths, stated to be obtained by Dr. Clarke of Cambridge, by the use of an improved blow pipe, were so important as to induce a desire to verify them in most persons. The experiments have frequently been made in this Institution, and were repeated a few days since in the presence of most of the distinguished chemists now in the metropolis, but always without success. The earths and their salts are fused, and the result is constantly the pure anhydrate, which appears as a hard stony mass, but never exposing a true metallic surface with a clean file, or effervescing with water or dilute acids. If impurities are present, there are different phenomena according to the nature of these impurities. When iron forceps are employed to hold the earth, a hard black slag is produced, which scratches glass,

and in some cases abrades the file, and is sometimes capable of exhibiting a polished surface approaching slightly towards plumbago, but no indications of a metal are obtained, and there is no liberation of gas, as might be expected, when it is thrown into water; for as Sir H. Davy has shewn in his researches on the nature of the earths, barium, when combined in very small quantities, even $\frac{1}{10}$th, with other metallic substance, as iron or mercury, causes, on being thrown into water, a copious evolution of gas.

A fine splinter of hematite was placed in the flame, and it instantly fused, but no decomposition took place; a crystal of oxide of tin was then exposed to it, and the heat was so intense as to sublime the substance, but it arose unaltered, no tin being reduced. This substance was remarkably infusible; and though the angles became rounded, it appeared to be rather from the volatilization of the oxide immediately from the solid state, than from a previous liquefaction of it.

It appears therefore that these substances, when treated per se, are not altered in their chemical nature, and that it is only the state of the body that is affected. When heated with charcoal or other combustibles, or even with other metals than those contained in them, a reduction takes place; but even all aids of this kind applied to the earths have as yet failed, in our laboratory, to effect their reduction.

It is scarcely possible to say what can be the cause of results so different as those obtained here and by Dr. Clarke at Cambridge. That the heat obtained was as great, may be judged from the fusion of corundum, rock crystal, pure alumine, &c. but it is probable that some impurities in the earths or supports used, have caused appearances on which the idea of decomposition has been founded. The effects of the instrument are certainly very great, but such as might be expected from the previous experiments made in America; thus the fusion of the earths and precious stones has been effected, and bodies formerly considered as fixed, volatilized, but no decided evidences have yet been offered of such extraordinary decompositions as those of the earths, and the experiments made in this place are all inimical to that conclusion. M. F.

Notice of some Experiments on Flame made by Sir H. Davy.

A series of experiments have lately been made on flame and inflammation, by Sir H. Davy, in the laboratory of the Royal Institution, and some that he had made in the country repeated, and they offer results of great interest in this part of chemical knowledge.

By rarefying explosive mixtures more or less by the air pump, it has been ascertained at what point they lose the power of inflaming by the electric spark. It appears that this differs with the various gases, some exploding in a rarer state than others, and the difference seems to depend on the heat required for the combustion of individual portions of the gas, and that given out by their combustion. Thus chlorine and hydrogene, which burn at a lower temperature than oxygene and hydrogene, and yet produce nearly as much heat, will bear a greater rarefaction before their combustibility is destroyed, because, as the heat produced by inflammation diminishes with the rarity of the mixture, the quantity requisite for the inflammation of contiguous portions of oxygene and hydrogene is sooner lost than when chlorine and hydrogene are used. This is proved still more decisively, by supplying by other means than the combustion of the gases the heat necessary for the continuance of inflammation, for it has been found that a mixture so rarefied as not to explode by the electric spark, did inflame when considerably heated. Sir H. Davy has also proved that the combustibility of all gaseous mixtures is increased by rarefaction by heat. These experiments are decidedly opposed, in their results, to those of M Grotthuss, and overturn the theory of that gentleman.

Sir H. Davy has ascertained that the compression produced by flame, is not the cause of continuous explosion; for an explosive mixture of hydro-phosphoric gas and oxygene was condensed into one fourth of its original volume without inflaming, though a heat not greater than 240° is required for its combustion.

The results obtained by diluting explosive mixtures with other gases, are likewise interesting. The power exerted by

elastic media in preventing the inflammation of such mixtures, seems, with the exception of the acid gases, to be as their densities and capacities for heat. These latter, because of their attraction for the water formed, are more efficacious in extinguishing flame than they otherwise would be. A result perfectly in harmony with the experiments by expansion, is, that those gases which require least heat for their combustion, bear the highest degree of dilution before their combustion is prevented. Details of these experiments, and the practical inferences to be drawn from them, we believe, will shortly be laid before the Royal Society. M. F.

On the Wire-gauze Safe-lamps.

The wire-gauze safe-lamp has been now in general use in almost all the northern mines infested with fire-damp, for eight months, without a single failure, not a square inch of skin, according to an expression of the gentleman most extensively concerned in the collieries, has been lost during that time in the parts of the mines where they have been used.

Sir H. Davy has lately had some lamps made of thick twilled iron gauze, which contains 16 wires in warp, and about 30 in weft. This material, though nearly as permeable to light and air, as the ordinary gauze, is far stronger, and does not, whilst in use, heat so much. A single lamp constructed of it never became red hot in the most explosive atmospheres to which it could be exposed, and no means that could be devised, inflamed jets and blowers thrown upon it on the outside.

The web is made after Sir H. Davy's directions by Bayliff and Rigge, wire-workers, Kendal, and lamps are now constructed of the improved material by Mr. Newman, Lisle-street. Should no objections arise in the collieries to its use, there is no doubt that as the old gauze in lamps is worn out, it will be replaced by the twilled gauze. With this material the cylinders can never require to be double.

Where a very strong light is required in collieries, a large wick may be used, and the cylinder be from 2 to 2.5 inches in diameter. Sir H. Davy has found that a glass cylinder placed

within, above the wick, as in the Liverpool lamp, makes it burn with great brightness, and when the fire-damp is explosive, causes it to give light instead of the wick.

M. F.

A NEW general enumeration of vegetables is announced as nearly ready for the press, under the title of "Editio nova Systematis Vegetabilium Linnæi," by Drs. Rœmer of Zurich, and Schultes of Landishutham in Bavaria. Such a work has become one of the most urgent wants in botany. It is now sixteen years since the first volume of Willdenow's Edition of the Species Plantarum was printed, during which time additions, equal perhaps to all that work contains, have been made to botany, only dispersed on such various points as to be nearly useless for want of the concentration we may now expect. The Editors are both advantageously known by their botanical publications; and we are glad to see that they propose to keep in view the industrious and judicious Willdenow in the progress of their work. The synonymy previous to Linnæus will be generally omitted, a defalcation in a work of this sort perhaps the least detrimental of any. They guess that the whole will be brought within the compass of five bulky octavos, and promise to attend to the purse of their purchasers, but not at the expense of their eyes, as has been done in the Liliputian duodecimos of Persoon.

Royal Institution, January 1, 1817.

The Members and Subscribers are informed that the Lectures will commence on Saturday, the first of February next, at Two in the Afternoon. When Mr. Brande will deliver his Introductory Discourse.—And that the following arrangements have been made for the Season.

On Mineralogical and Analytic Chemistry, and on the Arts connected with these subjects, by W. T. Brande, Esq. Sec. R. S. London, and F. R. S. Edin. Prof. Chem. R. I. &c.

On Practical Mechanics and its Applications to the Arts and to Manufactures. Part the Second, including the principles of Wheel Carriages, Wind and Water Engines and

Mills, Steam Engines and the Force of Gunpowder. By John Millington, Esq. Civil Engineer.

On Botany.—By Sir James Edward Smith, M. D. F. R. S. Pres. Lin. Soc.

On Drawing and Painting.—By W. M. Craig, Esq. delivered gratuitously,

On the Architectural and other Remains of Aboriginal, Roman, Saxon, and Norman Britain, illustrated by Drawings.—By Thomas Stackhouse, Esq.

The Practical LECTURES and DEMONSTRATIONS in CHEMISTRY, delivered in the Laboratory of the Royal Institution, by Mr. BRANDE, will begin on Tuesday, the 4th of February, at Nine in the Morning precisely, and will be continued at the same hour during the Season, on Tuesdays, Thursdays, and Saturdays. The Subjects are treated of in the following order.

Division I. Of the Powers and Properties of Matter, and the General Laws of Chemical Changes.

§ 1. Attraction—Crystallization—Chemical affinity—Laws of Combination and Decomposition.

§ 2. Light and Heat—Their influence as Chemical Agents in art and nature.

§ 3. Electricity — Its Laws and connexion with Chemical phenomena.

Division II. Of Undecompounded Substances and their Mutual Combinations.

§ 1. Substances that support Combustion, Oxygen, Chroline, Iodine.

§ 2. Inflammable and acidifiable Substances — Hydrogen—Nitrogen—Sulphur—Phosphorus—Carbon—Boron.

§ 3. Metals—and their Combinations with the various Substances described in the earlier part of the Course.

Division III. Vegetable Chemistry.

§ 1. Chemical Physiology of Vegetables.

§ 2. Modes of Analysis—Ultimate and proximate Elements.

§ 3. Processes of Fermentation, and their products.

Division IV. Chemistry of the Animal Kingdom.

§ 1. General views connected with this department of the Science.

§ 2. Composition and properties of the Solids and Fluids of Animals—Products of Disease.

§ 3. Animal Functions.

Division V. Geology.

§ 1. Primitive and secondary Rocks—Structure and situation of Veins.

§ 2. Decay of Rocks—Production of Soils—Their analysis and principles of Agricultural improvement.

§ 3. Mineral Waters—Methods of ascertaining their contents by Tests and by Analysis.

§ 4. Volcanic Rocks—Phenomena and Products of Volcanic eruptions.

In the First Division of each Course, the principles and objects of Chemical Science, and the general Laws of Chemical Changes are explained, and the phenomena of Attraction, and of Light, Heat, and Electricity developed, and illustrated by numerous experiments.

In the Second Division, the undecompounded bodies are examined, and the modes of procuring them in a pure form, and of ascertaining their chemical characters exhibited upon an extended scale. The Lectures on the Metals include a succinct account of Mineralogy, and of the methods of analysing and assaying Ores.

This part of the Courses will also contain a full examination of Pharmaceutical Chemistry; the Chemical Processes of the Pharmacopœiæ will be particularly described, and compared with those adopted by the Manufacturer.

The Third and Fourth Divisions relate to Organic Substances. The Chemical Changes induced by Vegetation are here inquired into; the principles of Vegetables, the theory of Fermentation, and the characters of its products are then examined.

The Chemical History of Animals is the next object of inquiry: it is illustrated by an examination of their component parts, in health and in disease; by an inquiry into the Chemistry of the Animal Functions, and into the application of Chemical principles to the treatment of Diseases.

The Courses conclude with an account of the Structure of the Earth, of the changes which it is undergoing, of the objects and uses of Geology, and of the principles of Agricultural Chemistry.

The applications of Chemistry to the Arts and Manufactures, and to economical purposes, are discussed at some length in various parts of the Courses, and the most important of them are experimentally exhibited.

Further particulars may be obtained by applying to Mr. Brande or to Mr. Fincher at the Royal Institution, 21, Albemarle-street.

In February will be published "OUTLINES OF GEOLOGY," being the substance of a Course of Lectures delivered in the Royal Institution, in the Spring of 1816, by W. T. Brande, Sec. R. S. &c. Published by John Murray, Albemarle-street.

NOTICE TO CORRESPONDENTS.

In consequence of an accident having occurred to the Wood-cuts, Mr. B. Gompertz's paper on the Pendulum is unavoidably postponed till the next Number.

Mr. Cooper on Platinum, has *not* come to hand.

The Editor regrets that the description of the Pheasant-breasted Duck is anonymous: therefore not inserted.

Many papers on Blow-pipes have been received, but not sufficiently original for insertion.

The Geological Observations of T. R. P. are not of a tone to be admitted here. *Ridentem dicere verum, quid vetat?* but it should be without *personality*.

The Editor begs to thank his Foreign Correspondents for their valuable communications and advice; he has especially to request that their letters may be forwarded earlier than usual, since their late arrival has prevented the insertion of several interesting Notices in the present Number.

The Proceedings of the Royal Academy of Sciences at Paris are deferred until the next Number.

Some interesting Botanical News from South America, want of room obliges us to reserve.

The Index to the present Volume will be delivered with Number V.

All Papers with Plates intended for insertion in this Journal, should be forwarded either to the Royal Institution, or to Mr. Murray the Publisher, at least one month previous to its publication.

Art. XXVI. Meteorological Diary for the Months of September, October, and November, 1816, kept at Earl Spencer's Seat at Althorp, in Northamptonshire. The Thermometer hangs in a north-eastern aspect, about five feet from the ground, and a foot from the wall.

METEOROLOGICAL DIARY

for September, 1816.

		Thermometer.		Barometer.		Wind.	
		Low.	High.	Morn.	Even.	Morn.	Even.
Sunday	1	46	53	29,35	29,42	NW	WNW
Monday	2	39	52	29,53	29,60	NW	WbN
Tuesday	3	35	54,5	29,64	29,59	W	S
Wednesday	4	44	54	29,30	29,27	WSW	WSW
Thursday	5	41	57,5	29,48	29,64	W	NW
Friday	6	39	56,5	29,79	29,79	NE	SE
Saturday	7	51	64	29,74	29,74	WSW	SW
Sunday	8	48	60	29,74	29,69	W	WSW
Monday	9	46	59,5	29,62	29,34	S	SW
Tuesday	10	54	62,5	29,39	29,60	SW	W
Wednesday	11	45	62	29,72	29,74	W	WSW
Thursday	12	40	60	29,83	29,94	W	W
Friday	13	38	60	30,04	30,01	NE	S
Saturday	14	54	68	29 93	29,93	S	S
Sunday	15	50	71	29,90	29,90	SW	SSW
Monday	16	46	66	29,92	29,92	W	N
Tuesday	17	54	65	29,90	29,82	ENE	ENE
Wednesday	18	52	57	29,88	29,91	NE	NE
Thursday	19	52,5	58	30,02	30,00	E	E
Friday	20	31,5	56	30,00	29,84	E	E
Saturday	21	35	55	29,65	29,56	E	E
Sunday	22	51	60,5	29,60	29,66	W	SE
Monday	23	48	58	29,75	29,72	NE	E
Tuesday	24	46,5	59,5	29,72	29,73	NE	SSE
Wednesday	25	43	63	29,95	29,99	SW	E
Thursday	26	35	60	30,05	30,03	E	WSW
Friday	27	45,5	61	30,10	30,08	SE	SW
Saturday	28	47	61,5	29,91	29,90	W	W
Sunday	29	46	58	29,58	29,21	S	WSW
Monday	30	43	57	29,61	29,61	SW	W

Notice of some Experiments on Flame made by Sir H. Davy.

A series of experiments have lately been made on flame and inflammation, by Sir H. Davy, in the laboratory of the Royal Institution, and some that he had made in the country repeated, and they offer results of great interest in this part of chemical knowledge.

By rarefying explosive mixtures more or less by the air pump, it has been ascertained at what point they lose the power of inflaming by the electric spark. It appears that this differs with the various gases, some exploding in a rarer state than others, and the difference seems to depend on the heat required for the combustion of individual portions of the gas, and that given out by their combustion. Thus chlorine and hydrogene, which burn at a lower temperature than oxygene and hydrogene, and yet produce nearly as much heat, will bear a greater rarefaction before their combustibility is destroyed, because, as the heat produced by inflammation diminishes with the rarity of the mixture, the quantity requisite for the inflammation of contiguous portions of oxygene and hydrogene is sooner lost than when chlorine and hydrogene are used. This is proved still more decisively, by supplying by other means than the combustion of the gases the heat necessary for the continuance of inflammation, for it has been found that a mixture so rarefied as not to explode by the electric spark, did inflame when considerably heated. Sir H. Davy has also proved that the combustibility of all gaseous mixtures is increased by rarefaction by heat. These experiments are decidedly opposed, in their results, to those of M. Grotthuss, and overturn the theory of that gentleman.

Sir H. Davy has ascertained that the compression produced by flame, is not the cause of continuous explosion; for an explosive mixture of hydro-phosphoric gas and oxygene was condensed into one fourth of its original volume without inflaming, though a heat not greater than 240° is required for its combustion.

The results obtained by diluting explosive mixtures with other gases, are likewise interesting. The power exerted by

elastic media in preventing the inflammation of such mixtures, seems, with the exception of the acid gases, to be as their densities and capacities for heat. These latter, because of their attraction for the water formed, are more efficacious in extinguishing flame than they otherwise would be. A result perfectly in harmony with the experiments by expansion, is, that those gases which require least heat for their combustion, bear the highest degree of dilution before their combustion is prevented. Details of these experiments, and the practical inferences to be drawn from them, we believe, will shortly be laid before the Royal Society. M. F.

On the Wire-gauze Safe-lamps.

The wire-gauze safe-lamp has been now in general use in almost all the northern mines infested with fire-damp, for eight months, without a single failure, not a square inch of skin, according to an expression of the gentleman most extensively concerned in the collieries, has been lost during that time in the parts of the mines where they have been used.

Sir H. Davy has lately had some lamps made of thick twilled iron gauze, which contains 16 wires in warp, and about 30 in weft. This material, though nearly as permeable to light and air, as the ordinary gauze, is far stronger, and does not, whilst in use, heat so much. A single lamp constructed of it never became red hot in the most explosive atmospheres to which it could be exposed, and no means that could be devised, inflamed jets and blowers thrown upon it on the outside.

The web is made after Sir H. Davy's directions by Bayliff and Rigge, wire-workers, Kendal, and lamps are now constructed of the improved material by Mr. Newman, Lisle-street. Should no objections arise in the collieries to its use, there is no doubt that as the old gauze in lamps is worn out, it will be replaced by the twilled gauze. With this material the cylinders can never require to be double.

Where a very strong light is required in collieries, a large wick may be used, and the cylinder be from 2 to 2.5 inches in diameter. Sir H. Davy has found that a glass cylinder placed

within, above the wick, as in the Liverpool lamp, makes it burn with great brightness, and when the fire-damp is explosive, causes it to give light instead of the wick.

M. F.

A NEW general enumeration of vegetables is announced as nearly ready for the press, under the title of "Editio nova Systematis Vegetabilium Linnæi," by Drs. Rœmer of Zurich, and Schultes of Landishutham in Bavaria. Such a work has become one of the most urgent wants in botany. It is now sixteen years since the first volume of Willdenow's Edition of the Species Plantarum was printed, during which time additions, equal perhaps to all that work contains, have been made to botany, only dispersed on such various points as to be nearly useless for want of the concentration we may now expect. The Editors are both advantageously known by their botanical publications; and we are glad to see that they propose to keep in view the industrious and judicious Willdenow in the progress of their work. The synonymy previous to Linnæus will be generally omitted, a defalcation in a work of this sort perhaps the least detrimental of any. They guess that the whole will be brought within the compass of five bulky octavos, and promise to attend to the purse of their purchasers, but not at the expense of their eyes, as has been done in the Liliputian duodecimos of Persoon.

Royal Institution, January 1, 1817.

The Members and Subscribers are informed that the Lectures will commence on Saturday, the first of February next, at Two in the Afternoon. When Mr. Brande will deliver his Introductory Discourse.—And that the following arrangements have been made for the Season.

On Mineralogical and Analytic Chemistry, and on the Arts connected with these subjects, by W. T. Brande, Esq. Sec. R. S. London, and F. R. S. Edin. Prof. Chem. R. I. &c.

On Practical Mechanics and its Applications to the Arts and to Manufactures. Part the Second, including the principles of Wheel Carriages, Wind and Water Engines and

Mills, Steam Engines and the Force of Gunpowder. By John Millington, Esq. Civil Engineer.

On Botany.—By Sir James Edward Smith, M. D. F. R. S. Pres. Lin. Soc.

On Drawing and Painting.—By W. M. Craig, Esq. delivered gratuitously,

On the Architectural and other Remains of Aboriginal, Roman, Saxon, and Norman Britain, illustrated by Drawings.—By Thomas Stackhouse, Esq.

The Practical LECTURES and DEMONSTRATIONS in CHEMISTRY, delivered in the Laboratory of the Royal Institution, by Mr. BRANDE, will begin on Tuesday, the 4th of February, at Nine in the Morning precisely, and will be continued at the same hour during the Season, on Tuesdays, Thursdays, and Saturdays. The Subjects are treated of in the following order.

Division I. Of the Powers and Properties of Matter, and the General Laws of Chemical Changes.

§ 1. Attraction—Crystallization—Chemical affinity—Laws of Combination and Decomposition.

§ 2. Light and Heat—Their influence as Chemical Agents in art and nature.

§ 3. Electricity — Its Laws and connexion with Chemical phenomena.

Division II. Of Undecompounded Substances and their Mutual Combinations.

§ 1. Substances that support Combustion, Oxygen, Chroline, Iodine.

§ 2. Inflammable and acidifiable Substances — Hydrogen—Nitrogen—Sulphur—Phosphorus—Carbon—Boron.

§ 3. Metals—and their Combinations with the various Substances described in the earlier part of the Course.

Division III. Vegetable Chemistry.

§ 1. Chemical Physiology of Vegetables.

§ 2. Modes of Analysis—Ultimate and proximate Elements.

§ 3. Processes of Fermentation, and their products.

Division IV. Chemistry of the Animal Kingdom.

§ 1. General views connected with this department of the Science.

§ 2. Composition and properties of the Solids and Fluids of Animals—Products of Disease.

§ 3. Animal Functions.

Division V. Geology.

§ 1. Primitive and secondary Rocks—Structure and situation of Veins.

§ 2. Decay of Rocks—Production of Soils—Their analysis and principles of Agricultural improvement.

§ 3. Mineral Waters—Methods of ascertaining their contents by Tests and by Analysis.

§ 4. Volcanic Rocks—Phenomena and Products of Volcanic eruptions.

In the First Division of each Course, the principles and objects of Chemical Science, and the general Laws of Chemical Changes are explained, and the phenomena of Attraction, and of Light, Heat, and Electricity developed, and illustrated by numerous experiments.

In the Second Division, the undecompounded bodies are examined, and the modes of procuring them in a pure form, and of ascertaining their chemical characters exhibited upon an extended scale. The Lectures on the Metals include a succinct account of Mineralogy, and of the methods of analysing and assaying Ores.

This part of the Courses will also contain a full examination of Pharmaceutical Chemistry; the Chemical Processes of the Pharmacopœiæ will be particularly described, and compared with those adopted by the Manufacturer.

The Third and Fourth Divisions relate to Organic Substances. The Chemical Changes induced by Vegetation are here inquired into; the principles of Vegetables, the theory of Fermentation, and the characters of its products are then examined.

The Chemical History of Animals is the next object of inquiry: it is illustrated by an examination of their component parts, in health and in disease; by an inquiry into the Chemistry of the Animal Functions, and into the application of Chemical principles to the treatment of Diseases.

The Courses conclude with an account of the Structure of the Earth, of the changes which it is undergoing, of the objects and uses of Geology, and of the principles of Agricultural Chemistry.

The applications of Chemistry to the Arts and Manufactures, and to economical purposes, are discussed at some length in various parts of the Courses, and the most important of them are experimentally exhibited.

Further particulars may be obtained by applying to Mr. Brande or to Mr. Fincher at the Royal Institution, 21, Albemarle-street.

In February will be published "OUTLINES OF GEOLOGY," being the substance of a Course of Lectures delivered in the Royal Institution, in the Spring of 1816, by W. T. Brande, Sec. R. S. &c. Published by John Murray, Albemarle-street.

NOTICE TO CORRESPONDENTS.

In consequence of an accident having occurred to the Wood-cuts, Mr. B. Gompertz's paper on the Pendulum is unavoidably postponed till the next Number.

Mr. Cooper on Platinum, has *not* come to hand.

The Editor regrets that the description of the Pheasant-breasted Duck is anonymous: therefore not inserted.

Many papers on Blow-pipes have been received, but not sufficiently original for insertion.

The Geological Observations of T. R. P. are not of a tone to be admitted here. *Ridentem dicere verum, quid vetat?* but it should be without *personality*.

The Editor begs to thank his Foreign Correspondents for their valuable communications and advice; he has especially to request that their letters may be forwarded earlier than usual, since their late arrival has prevented the insertion of several interesting Notices in the present Number.

The Proceedings of the Royal Academy of Sciences at Paris are deferred until the next Number.

Some interesting Botanical News from South America, want of room obliges us to reserve.

The Index to the present Volume will be delivered with Number V.

All Papers with Plates intended for insertion in this Journal, should be forwarded either to the Royal Institution, or to Mr. Murray the Publisher, at least one month previous to its publication.

Art. XXVI. Meteorological Diary for the Months of September, October, and November, 1816, kept at Earl Spencer's Seat at Althorp, in Northamptonshire. The Thermometer hangs in a north-eastern aspect, about five feet from the ground, and a foot from the wall.

METEOROLOGICAL DIARY

for September, 1816.

		Thermometer.		Barometer.		Wind.	
		Low.	High.	Morn.	Even.	Morn.	Even.
Sunday	1	46	53	29,35	29,42	NW	WNW
Monday	2	39	52	29,53	29,60	NW	WbN
Tuesday	3	35	54,5	29,64	29,59	W	S
Wednesday	4	44	54	29,30	29,27	WSW	WSW
Thursday	5	41	57,5	29,48	29,64	W	NW
Friday	6	39	56,5	29,79	29,79	NE	SE
Saturday	7	51	64	29,74	29,74	WSW	SW
Sunday	8	48	60	29,74	29,69	W	WSW
Monday	9	46	59,5	29,62	29,34	S	SW
Tuesday	10	54	62,5	29,39	29,60	SW	W
Wednesday	11	45	62	29,72	29,74	W	WSW
Thursday	12	40	60	29,83	29,94	W	W
Friday	13	38	60	30,04	30,01	NE	S
Saturday	14	54	68	29 93	29,93	S	S
Sunday	15	50	71	29,90	29,90	SW	SSW
Monday	16	46	66	29,92	29,92	W	N
Tuesday	17	54	65	29,90	29,82	ENE	ENE
Wednesday	18	52	57	29,88	29,91	NE	NE
Thursday	19	52,5	58	30,02	30,00	E	E
Friday	20	31,5	56	30,00	29,84	E	E
Saturday	21	35	55	29,65	29,56	E	E
Sunday	22	51	60,5	29,60	29,66	W	SE
Monday	23	48	58	29,75	29,72	NE	E
Tuesday	24	46,5	59,5	29,72	29,73	NE	SSE
Wednesday	25	43	63	29,95	29,99	SW	E
Thursday	26	35	60	30,05	30,03	E	WSW
Friday	27	45,5	61	30,10	30,08	SE	SW
Saturday	28	47	61,5	29,91	29,90	W	W
Sunday	29	46	58	29,58	29,21	S	WSW
Monday	30	43	57	29,61	29,61	SW	W

METEOROLOGICAL DIARY

for October, 1816.

		Thermometer.		Barometer.		Wind.	
		Low.	High.	Morn.	Even.	Morn.	Even.
Tuesday	1	50	61	29,27	29,50	W	W
Wednesday	2	47	60	29,46	29,41	W	WSW
Thursday	3	41	54	29,83	29,83	WSW	S
Friday	4	51	63	29,74	29,75	W	SSW
Saturday	5	54	62,5	29,77	29,74	S	SE
Sunday	6	53	64	29,75	29,77	W	E
Monday	7	43	53	29,77	29,78	NE	NE
Tuesday	8	52	59	29,80	29,90	SE	E
Wednesday	9	45	58	29,92	29,92	E	E
Thursday	10	54	62	29,95	29,95	E	SSE
Friday	11	50	59	29,90	29,91	W	NW
Saturday	12	44	55	30,	30,01	W	S
Sunday	13	40	54	30,01	29,98	SE	S
Monday	14	39	57,5	29,98	30,	WbS	W
Tuesday	15	40	57,5	30,05	30,05	SE	S
Wednesday	16	38	57	30,	29,82	SE	SE
Thursday	17	37,5	51,5	29,70	29,68	W	W
Friday	18	37	51	29,66	29,79	W	W
Saturday	19	33,5	54	29,79	29,60	W	W
Sunday	20	37	48	29,51	29,51	W	W
Monday	21	39	49	29,58	29,64	W	W
Tuesday	22	38	51	29,56	29,60	W	W
Wednesday	23	32	45	29,80	29,82	W	S
Thursday	24	37	50	29,65	29,53	S	SE
Friday	25	39	49	29,36	29,20	E	SE
Saturday	26	28,5	49	29,46	29,54	SE	E
Sunday	27	37	56,5	29,58	29,58	E	E
Monday	28	45	55	29,52	29,52	ENE	
Tuesday	29	41	53	29,50	29,43	E	SE
Wednesday	30	45	49,5	29,18	29,11	E	SE
Thursday	31	45	51	29,08	29,18	SW	SE

METEOROLOGICAL DIARY

for November, 1816.

		Thermometer.		Barometer.		Wind.	
		Low.	High.	Morn.	Even.	Morn.	Even.
Friday	1	37	47	29,20	29,20	W	W
Saturday	2	29	44,5	29,25	29,17	NE	SE
Sunday	3	39	46	29,22	29,42	W	SSE
Monday	4	29	48	29,60	29,60	NNE	E
Tuesday	5	42	49	29,61	29,53	E	E
Wednesday	6	45	48,5	29,35	29,29	SSW	W
Thursday	7	33	37,5	29,29	29,24	WbN	NW
Friday	8	23	33	29,39	29,39	WbS	S
Saturday	9	32	45,5	28,86	28,67	SW	SW
Sunday	10	30	34	29,26	29,34	NW	SW
Monday	11	16,5	36	29,59	29,44	W	SW
Tuesday	12	34	47	29,10	29,51	SW	W
Wednesday	13	39	53	29,53	29,53	W	W
Thursday	14	35,5	42,5	29,53	29,41	W	WbS
Friday	15	27,5	35	29,35	29,45	WbS	NNW
Saturday	16	24	36,5	29,68	29,87	NW	WNW
Sunday	17	24,5	34	29,94	29,87	W	SW
Monday	18	33,5	44	29,59	29,51	W	WbS
Tuesday	19	26	44	29,60	29,68	SW	SSW
Wednesday	20	39	48,5	29,69	29,80	SW	S
Thursday	21	39,5	42,5	29,85	29,80	SE	SE
Friday	22	36	37	29,70	29,70	E	ENE
Saturday	23	26	31	29,70	29,70	ENE	E
Sunday	24	17	28	29,79	29,79	WSW	W
Monday	25	20	37	29,79	29,78	SSW	SSE
Tuesday	26	37	48	29,80	29,96	NNW	WNW
Wednesday	27	29	47	30,10	30,12	WbS	SW
Thursday	28	33,5	43	30,20	30,20	SW	WSW
Friday	29	30	41,5	30,39	30,41	WbN	W
Saturday	30	31	36,5	30,53	30,55	NNE	N

ON THE

ADVANCEMENT OF SCIENCE,

AS CONNECTED WITH

THE RISE AND PROGRESS

OF THE

ROYAL INSTITUTION.

In terminating the first year of their labours, the Editors of the Journal of the Royal Institution are urged by weighty considerations to take a retrospective view of the general progress of science and to collect together the scattered facts which form the degrees of a scale whereon to measure the advancement of knowledge and the improvement of the human intellect. To those who tread the unbeaten paths of unexplored regions, it is refreshing to pause and look back upon the tract which has been past, and the contemplation of difficulties overcome and progress made inspires fresh vigour for exertion, and assists in forming useful anticipations of future prospects. Nothing is more animating than to connect with our own the toils of our fellow-

labourers; and the circle of our pursuits seems to expand as we contemplate the concentric efforts of others, and view the unity of design of the whole combined. It can but rarely happen that the concentrated genius of ages, and the multifarious science of a wide-extended world, should be traced before us by a master's hand, in one clear and highly finished picture; but when such a view is offered, we know of no greater intellectual treat; we seek for no greater incentive to perseverance. Our own efforts rise to importance as parts of the superstructure which had its foundation in collected wisdom, and we feel the invincible enthusiasm of the followers of a victorious chief, as we range ourselves under the banners of Newton, of Bacon, and of Boyle. If Mathematicians, we behold the abstruse calculations of numbers and of space applied to the forms of matter; and we contemplate with no less wonder and delight the Chemist calculating the composition of bodies by figures, and conducting analyses by a scale, than the Astronomer weighing the masses of the planets, and computing the revolutions of a system: as Astronomers, we see the Mineralogist applying the laws of gravity to an atom, and developing an analogy between invisible molecules and the heavenly spheres; and we ourselves borrow the observations of the Geologist to correct our calculations and perfect our means of inquiry: we feel conscious that the pursuits of science, however various in appearance, are insepa-

rably linked together; and we return with double relish each to our respective study, conscious of a wider field and almost of enlarged powers of research. Such are the advantages which we derive from the encyclopædiacal eloquence of a Stewart or a Playfair —Something of the same spirit may be caught from a less expanded retrospect; and we trust, that in presenting to our readers an annual sketch of the progress of science, we shall be performing an useful and acceptable service.

But higher motives influence us on the present occasion, and will constrain us, while we extend the period of our inquiry, to bound our review to a narrower circle. We do not now address the public as mere Journalists, but we raise the voice of the Royal Institution of Great Britain; and in tracing rapidly the march of science from the foundation of our establishment, we shall reclaim with pride the concentrated glory of discoveries, which would have shed no mean lustre, diffused over the philosophy of an age.

On the first proposition for this Philosophical Association in the year 1800, one of the principal objections to it was, that it would tend to diminish the importance of our elder establishments: a practical argument against this idea we will now give, upon the experience of seventeen years, by referring principally to the annals of the Royal Society, for the record of our services. Nor will it be any disparagement to the dignity of that venerable

body to shew, that some of the fairest flowers of her later Transactions were sown and nurtured by the experimental manipulations not of a jealous rival, but of an useful and laborious ally.

The history of chemical science must for ever date one of its principal epochs from the foundation of the Laboratory of the Royal Institution. The reformed doctrines of the French school were but just firmly established by the powerful engine of her nomenclature, and the expiring groans of the phlogistic hypothesis, were still heard in the last writings of Dr. Priestley, when a new power of nature was developed by the experiments of Galvani, and a new and powerful instrument of research, combined by the genius of Volta. The experimentalists of our school were not behind others in their investigations of the laws of Galvanism; and various were their improvements in the Voltaic apparatus, till its splendid powers were first fully displayed in giant greatness, in the battery of the Institution. The impulse which was given to science by these striking discoveries, vibrated to every part of the civilized world, and the crowded lectures in which such wonderful novelties were displayed with all the powers of eloquence, and all the aids of a splendid apparatus, contributed not a little in this country, to the rapid diffusion of a taste for philosophic inquiry.

Nor was it only in the higher walks of science, that the rising establishment distinguished the

opening of her career. Let those come forward and bear witness to her useful attention to minor subjects, who have received the ready assistance of her out-stretched hand. The processes of one highly important manufacture, in particular, were first submitted to investigation within her walls, and from these illustrations and experiments in the art of tanning and leather-making, were derived the first just ideas of important improvements, founded upon scientific principles. The agriculturist, the manufacturer, and the miner, have all received, in their various pursuits, gratuitous and cheerful aid; and the intercourse which has been facilitated in her apartments, between patrons of science, scientific men, and the promoters of manufactures and arts, has tended to inspire that activity and energy which springs most luxuriantly from the free interchange of opinion.

The mechanical sciences, likewise received their due share of patronage and advancement, and nothing was omitted which could tend to the improvement of the arts, subservient to the conveniences of life. In the courses of lectures delivered by the Professor of Natural Philosophy, the fundamental doctrines of motion were referred to simple mathematical axioms, more immediately than had before been usual, and their application to practical purposes was much facilitated. The passive strength of materials of all kinds, was investigated, and many new conclusions respecting it were

formed, of considerable importance to the engineer and architect: the theory and motion of waves, the circulation of the blood, and the propagation of sound, were simplified, extended, and illustrated. In the science of optics, the functions of the eye, and the curvature of images, formed by lenses and mirrors, were minutely examined and investigated, and some new phenomena of coloured light were pointed out. He also reduced the theory of tides to a simple form, and in investigating the cohesion and capillary action of fluids, he anticipated the conclusions of Laplace. To these may be added, many comparative and useful experiments on the elasticity of steam, and on evaporation.

Nor ought we to pass over in silence, the earlier services of Count Rumford. He was one of the first promoters, if not the original proposer, of our Association; and many of his experiments on the properties and œconomical distribution of heat, which are known in all the countries of Europe, by their useful application; and many of his philanthropic schemes, for the alleviation of distress, in times of scarcity, were devised and executed in this school of science. Whatever were his faults, they are now buried in the last receptacle of human frailty, and his better fame remains to distinguish his name in all future ages, as an experimental philosopher, and a zealous projector for the public good.

Thus diffusing on one hand the elements of

science, to crowds of the fashionable world, who were delighted at the new source of instructive amusement thus opened to them, and on the other, maintaining an honourable and emulous contest with the profoundest philosophers of the age, in the paths of discovery and experiment, the Royal Institution rose to a height of distinction which has been rarely attained.

It was now that a light broke forth from her laboratory, whose splendor was to radiate to every branch of chemical science, and which, while it confirmed in some things the generally received doctrines, was destined to effect a revolution in others, as important as it was unlooked for. The splendid means which had been supplied by the liberality of the Society, were happily directed by a Master's hand. The chemical agencies of Electricity were traced with laborious accuracy in the Lectures of the Chemical Professor; and their more full developement in the Philosophical Transactions, will for ever stand one of the most remarkable specimens of accurate induction, which has been produced by the human intellect. Foreign nations were emulous in offering their tribute of admiration to the genius of the Britith school, and the rival policy of a hostile government presented a civic crown to the pre-eminence of transcendent merit.

The fruit of these laborious researches, quickly followed in the decomposition of the fixed alkalies,

which put into the hands of the experimentalist another mean of analysis, scarcely less powerful, or of less universal application than the power from whence it emanated. The energy which was thus communicated to science, spread to all the parts of the civilized world with the rapidity of the electric shock; the rays of the new light were reflected from every quarter; and discoveries, which were but the consequences of the newly-ascertained law of nature, flowed in with a tide which almost overwhelmed the imagination. The decomposition of the earths, of the boracic acid, and the metallization of ammonia, gave reason to anticipate a still greater reduction in the numbers of the undecomposed bodies; and the new views thus opened of the sublime simplicity of the operations of nature, were well calculated to excite fresh ardour in following up the magnificent unity of their design.

The improved processes for obtaining the alkaline metals in large quantities, was no sooner announced from France, than they were adopted here; and throughout these active inquiries, we are at a loss how sufficiently to admire the indefatigable industry which repeated and confirmed with one hand the almost innumerable experiments of others, and unravelled with the other the clue of discovery.

Next to the impetus which the novel display of the secrets of nature gives to the progress of science, may be ranked the increase of power which she derives from the removal of the dead weight of preju-

dice and error. The invention of the telescope and the discovery of Jupiter's satellites were scarcely more conducive to the advancement of astronomy, than the refutation of the hypothesis which placed the earth in the centre of the universe, and supposed the sun to perform its revolution around it. The systematic language of the French school, which had so powerfully contributed to the reform of chemistry, had established not less firmly certain gratuitous assumptions, which were the more dangerous, as they formed parts of a system, and were not destitute of the support of specious analogies. Such were the principles which referred all cases of combustion and acidification indiscriminately to the agency of oxygen, and the dogmatical determination of the nature of the muriatic acid. It is in this field that we again find the British school distinguishing itself; and the same hand which scattered so widely the seeds of discovery, employed in eradicating the deeply-rooted weeds which incumber the soil. It was proved that combustion was the general result of energetic action; and if we were asked to select the discovery which marked most decidedly the genius of a Davy, we should without hesitation adduce the train of experiment, argument, and demonstration, which brought back the science to the strictness of induction, by establishing the theory of chlorine and its compounds. When we consider the talent and experimental skill which was long ranged on the other side of this

intricate question; when we recollect that the chemists of France, Germany, and Sweden, with the majority of those of our own country, long supported the ancient doctrine in one of the acutest controversies which ever sprung from physical researches, we shall own, that if the present almost unanimous conviction is honourable to those from whom it was won, that it is doubly glorious to the discriminating judgment which produced it. The history of opinion in all ages will attest how hard a thing it is

> To chase out of our sight,
> With the plain magic of true reason's light,
> Authority, which did a body boast,
> Though 'twas but air condens'd, and stalk'd about
> Like some old giant's more gigantic ghost,
> To terrify the learned rout.

When a new supporter of combustion was brought to light by the discovery of Iode, the determination of its nature and properties was rendered comparatively easy by the reformation which had taken place, and the reformed theory received additional support from new analogies, the strongest and most convincing.

The theory of definite proportion, the effect of which in advancing the interests of chemistry can only be compared to the revolution formerly produced by the French nomenclature, is the undisputed discovery of the chemists of our native country. The experiments of Higgins and of Dalton have received some of their strongest confirmations

from the activity of the Royal Institution; and the praise of having divested the doctrine of its hypothetical dress, and of having placed before us the harmony of numerical results, without any attendant surmises upon the forms and weights of ultimate atoms, is due to Sir H. Davy.

Nothing can be more disgusting than the ignorant objection which is sometimes made to the discoveries and often abstruse speculations of philosophy, that they lead to no practical good, and are connected in no sensible degree with the arts of life. Such objectors are at a loss to conceive that there should be any connection between the gigantic extension of human power by the steam-engine, and the subtle inquiries of Black into the laws of an etherial fluid. To them the maxim that "knowledge is power," must be demonstrated by the actual contact of cause and effect; and they fail to trace remote consequences to what appear nearly evanescent principles. But even to such, the last great series of experiment, conducted within the walls of our establishment, may appeal for the meed of useful and patriotic exertion. It has been well said, with reference to the train of research to which we allude, that "if Bacon were to revisit the earth, this is exactly such a case as we should choose to place before him, in order to give him, in a small compass, an idea of the advancement which Philosophy had made since the time when he had pointed out to her the route which she ought to pursue." Nothing

fortuitous was in any way connected with the results. The problem to be resolved was in express terms; and the solution, commencing with simple and known principles, ascended step by step to the complete fulfilment of the conditions.

The effect of the explosion of fire damp in coal-mines has long been known and deplored; but the frequency and devastating consequences of it in the last few years, has made every friend of humanity shudder, and look forward with horror to the certainty of its more frequent occurrence, in proportion to the daily-extending progress of the miner in his subterraneous operations. By a late explosion in one of the Newcastle collieries, no less than one hundred and one persons perished in an instant; and the accumulated misery which devolved upon their ruined families, to the amount of above three hundred persons, may be more easily conceived than described. Urged by the heart-rending cry of suffering humanity, Science turned aside from her speculations, and after an examination of the nature of the enemy with which she had to contend, traced, with laborious and often dangerous perseverance, its most recondite principles, and at length presented to the astonished and grateful miner the ignited elements of explosion fluttering harmless in a wire cage. Never was there an invention better calculated to prove to the ignorant the connection between science and the arts of life: never was there a result of induction more satisfactory to

philosophers than the safety-lamp of Sir Humphry Davy.

But whilst proclaiming a train of discoveries whose splendour and importance have never been equalled, and whose bright effulgence will distinguish her name as the names of those in whom she glories as her sons, the Royal Institution has not been unmindful of less striking, though scarcely less useful interests. In the department of Geology, she boasts of the first attempt to describe the strata and mineral productions of Great Britain, with reference to a collection ever open to the public. From the zealous exertions of her Members, this Museum is daily receiving fresh accessions; and it is to be hoped that it will shortly derive, from a plan which is in agitation, an importance inferior to none in Europe. The Mineralogical Collection, if unfortunately not as costly or complete as might be wished, is constantly increasing from the liberality of individuals; and it may be fairly questioned whether, from the Courses of Lectures which are given upon it, and from the illustrations which it affords to the Professor, it is not more really useful than splendid and sumptuous specimens, which never see the light except at the request of some privileged few, or at most are left to gratify the stare of ignorance.

As a school of Chemistry, we boldly challenge competition. In the morning courses of the Pro-

fessor, the elements of the science, its minute details, and the operations of the laboratory are laid down with minuteness and precision. It is here that men of every profession obtain the rudiments of a branch of liberal education, of which general opinion renders it almost disgraceful for any to be ignorant. If the policy of our Colleges requires from the medical student certificates of his competence in this necessary knowledge, the suffrage of the world now calls for it scarcely less imperiously from all who rank as gentlemen. The rapid progress of discovery is here followed with proportionate assiduity; and without the labours of manipulation, the lover of experimental philosophy may see repeated and hear discussed the most novel analyses of the works of nature. Nor of less importance are the popular lectures delivered weekly in our theatre. It is here, that we behold a sight not to be paralleled in the civilized world. It is hither, that our countrywomen flock to give their all-powerful countenance to pursuits which ennoble the mind. While beauty and fashion continue to patronize mental improvement, it will ever be unfashionable to be uninformed; while the female classes exert their influence to keep alive a love of instruction, it will be doubly disgraceful for men to be ignorant. And while we acknowledge with gratitude the benefit which science derives from a patronage which is as irre-

sistible as it is extensive, justice calls upon us to rebut the charge of fickleness. Since the first foundation of the institution, the female part of our audiences has never deserted us. Long may the ladies of London continue to derive "that healthy and refined amusement which results from a perception of the variety and harmony existing in the kingdoms of nature, and to encourage the study of those more elegant departments of science which at once tend to exalt the understanding and purify the heart."*

In the class of Mechanics, our exertions are at present necessarily limited to the popular course delivered once a week. The first principles of the science are laid down with that clearness and pre-

* It was with considerable pain that we lately observed in a publication which we respect, a most unprovoked attack upon the Royal Institution. We will tell the British Critic, that *he advances the cause of ignorance*, who excludes the female sex from knowledge, and debars them from the rational amusement and instruction of the mind. We will tell him that *he sacrifices to the shrine of folly*, who, in a fit of spleen selects a work which displays a "clear and accurate knowledge of the various sub-"jects which it is intended to illustrate and adorn" as a fit text for a diatribe against the school from which the authoress has had the candour to acknowledge that she derives all her advantages. We, too, *protest against the degradation of high talents to silly purposes*, and we warn the Reviewer, that the Royal Institution, which always had the wish, has now the power to expose illiberality, and hold up abuse to the contempt which it deserves.

cision which are suited to a general auditory; and no pains are spared to explain and illustrate the numerous inventions which are perpetually diminishing the toil and adding to the power of our different manufactures. We trust that at some future and not very distant period, we may be enabled to render this department as complete as that of chemistry; and that by forming a collection of models, we may be the means of establishing a practical school, in a country which of all others would have most reason to pride itself on such an exhibition.

Lectures on Botany still continue to be delivered, and the name of our Professor of this science is sufficient pledge that justice is done to the interest and elegance of the subject.

In favour of the Fine Arts, we blush not to say that we sometimes relax the academic strictness of our laws. We consider it no disgrace that the first masters of Poetry, Eloquence, and Music, have been heard within our walls; and we cannot blame the taste which has drawn overflowing crowds to listen to the charms of such attractive sounds. Even the most rigid critic, we may be allowed to hope, will not condemn the policy of laying under contribution the pleasures of the lighter Muses to enliven the severer studies of their graver sisters.

Speaking of the Royal Institution as a school of scientific and literary information, the extensive

and well selected Library deserves particular attention. It contains more then twenty thousand volumes of the best authors in all current languages, and is always open for the use of members and subscribers; and as no book is ever permitted to be taken out of the house of the Institution, the visiter is always certain of finding the object of his inquiry. This, likewise, is an extending branch of the establishment: a certain number of books is annually added by purchase, and the list of donations printed in the present Number of this Journal announces that the President, Members, and others, are not unmindful of its increase. The Catalogue drawn up by the Librarian renders its contents easy of access, and adds much to its general usefulness.

Last and (under the shadow of our office we may say it) not least comes our own peculiar department. When first we commenced our career, we proclaimed our wish that an opinion should be formed of the interest and spirit of the undertaking by an inspection of the work rather than upon the suggestions of a prospectus and the promises of an advertisement. The period of probation is accomplished, and we are proud to acknowledge the marked approval of the public voice. If we have succeeded beyond our most sanguine expectations under the disadvantages and diffidence of a first essay, the additional stimulus which we now derive from an established character,

must almost in future command success. While we glory in the encouragement which we derive from the approval of our native country we are scarcely less elated at the distinction which has been conferred upon us by foreign literati. We have been read, quoted, and criticised in all the countries of Europe most distinguished by their scientific attainments, and we may indulge the hope that the field which is thus opened for discussion and liberal criticism in the wide-extended republic of letters, may be highly conducive to the progress of science, and tend to cherish those feelings of acquaintance, benevolence, and respect amongst philosophers of all nations, which it were to be wished could be at all times preserved independant of political relations. The dignity of our national academies precludes any thing of the nature of controversy, much more is it beyond their province to take cognizance of the advancement of science in foreign lands, to canvass speculations, or to attempt to guide opinion. Sparks of truth may be kindled by the collision of genius; and we may hope that the peculiarity of our constitution, which enables us to throw down the gauntlet, will at the same time insure to us dignity and temper in the course which we may have to run. We hail with pleasure the acceptance of the gage by the philosophers of France.

And can it now be a question whether the Royal Institution is to stand? We boldly answer, No.

But while we affirm with confidence the permanence of an establishment which has already done such good service to the state, we must not disguise the difficulties with which we have to contend, nor, like unskilful physicians, cicatrize wounds which we ought to probe. The income of the Society is unfortunately of a fluctuating nature, and depends too much upon fashion and caprice; but whenever the Managers have found it necessary to make an appeal to the liberality of the members, it has always been answered with cheerful alacrity. It may perhaps be said, that in the exercise of their discretion, they were not sufficiently provident, when the tide of fortune flowed in upon them, to fill their reservoirs in anticipation of its ebb. It may be so;—and if there is one circumstance which above all others encourages our best hopes, it is that the expenditure of the last year has been reduced (though but a trifle), within the receipts. The plan adopted for the present year promises a still greater amendment; and we may confidently anticipate the extinction of a part of the debt, (which does not amount to £2300. !) as the first step towards the establishment of a fund which may render our exertions independent of the favours of ephemeral fashion. But it must be remembered, that it is by painful sacrifices and a too rigid œconomy, that we have been enabled to effect this desirable purpose. Our arrears, trifling as they are, clog our exertions; and the hands of the Hercules, who

even in his infant days, has given such promise of future excellence, are bound by a mere spiders' web.

Ought this to be?

If it be true, which all history proclaims, that the prosperity, the riches, the commerce of a country, are indispensably connected with the progress of the Arts and Sciences, we might surely venture an appeal to the Legislature itself. It might possibly be considered as not beneath the dignity of state policy, to consider whether, while it is meting out with no sparing hand, the just reward to those who have raised the country to glory by the arts of war, it might not be right to hold forth some encouragement to others, who have raised the British name at least as high, by pursuits which tend to the civilization and general improvement of mankind. Supposing it, however, to be determined, that the shrine of philosophy should still be left to the exclusive charge of the votaries of the peaceful goddess, can it be deemed worthy of the Government of an enlightened people, that the exertions of individuals, which tend so much to the benefit and exaltation of the nation, should be taxed for the general purposes of the State?*

To the princes of the land, we might also turn

* One of the advantages of the present prospects of the Institution, is the cessation of the tax of 10 per cent. upon its income!

for patronage and encouragement. At the commencement of a new epoch, when the genius of peace has once more returned to her long-forsaken abode upon the earth, what plainer course is open to glory than that of the patrons of arts and sciences. We would remind them in the words of the eloquent Bishop Sprat, of "what reverence all anti-"quity had for the authors of natural discoveries. "Their founders of philosophical opinions, were "only admired by their own sects. Their valiant "men did seldom rise higher than demi-gods and "heroes; but the gods whom they worshipped "with temples and altars, were those who instructed "the world to sow, to plant, to spin, to build "houses, and to find out new countries. This zeal, "indeed, by which they expressed their gratitude "to such benefactors, degenerated into supersti-"tion; yet has it taught us that a higher degree "of reputation is due to discoveries than to the "teachers of speculative doctrines; nay even to "conquerors themselves. In the whole history of "the first monarchs of the world before the flood, "from Adam to Noah, there is no mention of their "wars or victories: all that is recorded, is this— "they lived so many years, and taught their pos-"terity to keep sheep, to till the ground, to plant "vineyards, to dwell in tents, to build cities, to "play on the harp and organ, and to work in brass "and iron."

The sovereigns of foreign lands are daily offering

new premiums for the advancement of the arts of civilised life, and even establish orders of knighthood for the honourable distinction of civil services; and shall British princes refuse their countenance to the corresponding energies which can alone, in times like these, preserve the proud superiority of their native land?

But should we plead in vain, should our feeble voice be lost amongst the pressing cases of the State, or the bustle of the Court, all turn again with confidence to the source which has never failed us; to the liberality of the British public. Under the shadow of these wings, Science has long been nurtured in this land, and here she will always find shelter and protection. It has ever been the boast of Great Britain, that nearly all that has been done for Science, has been effected by the exertions of individuals. Whether this is at the same time, the justification of her rulers, we will not now inquire. When we look at the splendid list of noblemen and gentlemen, patrons of Science and scientific men, which we this day lay before our readers as members of our Society, we feel certain that the failure of the Royal Institution will never disgrace the present age. Be it remembered, at all events, that we sink not noiseless into oblivion: our fame is gone abroad to all the corners of the earth; and if we fail in the face of the world, our lists will no longer be the register of names which radiate and reflect the glory of this splendid esta-

blishment, but the barren catalogue of those who had not spirit enough to support an Institution which had been so pre-eminently distinguished in the cause of humanity and philosophy.

THE QUARTERLY JOURNAL OF SCIENCE AND THE ARTS.

ART. I. *An Enquiry into the Origin of our Notion of Distance. Drawn up from Notes left by the late* THOMAS WEDGWOOD, *Esq.*

SINCE the publication of Bishop Berkeley's Theory of Vision, it seems to have been unanimously admitted by philosophers, that our visual perceptions undergo, in the progress of experience, an important and extraordinary revolution.

The eye originally perceives only length and breadth, not depth or distance from itself. Some philosophers allow it no other original perception but that of light and colours: the majority, however, have held, that space in two of its dimensions is a primary object of vision.

It has been generally said, that all objects in this original state appear in the same plane. This is an incorrectness naturally arising from the inadequacy of language to the description of this unremembered state of mind, and from the almost inevitable anticipation of terms, which are only significant when they relate to a more advanced stage in the progress of experience. A plane (as Condillac and Reid have observed) implies the existence of a solid, and is not, therefore, a proper term in that state of perception which precedes all notion of solidity. An object removed from the eye must then have appeared only to lessen; and an object placed at different distances from the eye, must have appeared to have different magnitudes, or rather to be different objects.

In process of time we acquire a notion of distance from the eye, or what Berkeley calls outness. We form tolerably correct estimates of what we call the real distances and magnitudes of objects not very remote from us, and we substitute them so instantaneously for the apparent ones, that the mind is unconscious of the change, and mankind in general consider real magnitude and distance from ourselves as direct and primary perceptions of sight. By this great change, which it is impossible for any man who has grown up to maturity, with the use of his senses, fully to conceive, vision becomes so important and comprehensive an inlet of knowledge.

Doctor Berkeley, who first demonstrated the reality of this change, has endeavoured to explain its nature, and his beautiful theory has been received with general assent. Distance and magnitude are, according to his perceptions, acquired by the sense of touch. When we have learned by touch the real magnitude of an object, the visual or apparent magnitude becomes only a sign which instantly suggests the tactual magnitude. As in the case of language, the mind passes over the sign, and attends only to the thing signified. The visual magnitude, which in the primitive state of the human mind was its only object, in the progress of experience entirely vanishes from its notice. It so immediately calls up the tactual magnitude, that what can only be touched appears to us to be seen.

Much of this ingenious theory is undoubtedly true, and was in the time of Berkeley, in the proper sense of the term, a discovery. He first clearly proved the original imbecility and confusion of the sense of sight, and its subsequent acquirements. He showed the instantaneous correction of visual appearances, by notions derived from experience; and he was the first who advanced the important principle, that some perceptions are capable of becoming a language by which other perceptions are represented and suggested. These are additions to the stock of certain knowledge; but that the notions of distance and magnitude are acquired by the sense of touch, will perhaps appear to be doubtful.

It will surely be admitted that touch is altogether incom-

petent to give a notion of colour; but rigidly excluding every idea of colour—what distinct notion can remain of any visual object or of its outness? I can as readily conceive a triangle, which is neither equilateral, nor isosceles, nor scalene, as I can imagine magnitude or figure to exist independent of colour.

Let any one try to consider abstractedly the impression of touch from a point or a ball, and he will find himself utterly unable to divest it of the idea of the figure of the object. If there be then any such quality as tactual magnitude or figure, at least we are ignorant of its nature, since it always occurs united with ideas of sight. This invariable conjunction of the notions of touch and sight prevents our ever ascertaining distinctly their separate properties; hence the one is frequently mistaken for the other; the secondary for the principal. I shall give an instance or two. A person thinks that when his skin is simply cooled, the feeling is different from what he experiences when it is cooled by the application of cold water. Try the experiment. Blindfold him, and put a tin funnel into his hand; fill it gently with water without letting him know that you are doing so; he will observe that his hand is simply cooled. Remove the bandage from his eyes, and hastily pour water into the funnel with such force, that it shall seem to splash over; he will now say that he feels his hand wetted as well as cooled. It is certain that the sensation of touch was the same in both cases, but there was present in the latter a vivid idea of water on the skin, from the imagined dashing over the funnel. It follows, that the supposed difference resulted from the obtrusion of a visual idea in the latter case, which was absent in the former.

On the same principle depends the common experiment of a body seeming double when felt in the angle of the tips of the first and second finger crossed. A person is blindfolded, and desired to attend to the impression of touch from a body so placed: the bandage being removed, he is directed to look at his fingers, while the object is placed as before. He will say, that the first time he felt two bodies at a distance from each other, and that now he feels only one: in his prior experience, if similar sensations occurred on the remote sides of

those two fingers, they had always been occasioned by the contact of two bodies; when he was blindfolded therefore, the idea of the usual visual appearance of two bodies came into his mind, and made him imagine that he touched two bodies; when the bandage was removed, and he saw that there was but one, he immediately perceived that he felt but one. As the sensations of touch from the same impressing body must have been the same in both cases, the supposed difference in them must have been owing to some circumstance of vision: in the first case, the experimenter was deceived by a visual idea; in the second, he was rightly informed by a visual impression.

In the same manner we may conclude that the notions of magnitude and figure, suggested to us by the contact of solid bodies in the dark, are derived from the visual idea of the portions of our skin which are touched by the solid bodies. If we grasp a small body in the dark, we have a visual idea of that portion of the hand which enfolds it: if the whole length of our arm touches the solid body, our judgment of its size is formed from a visual idea of the length of the arm.

But some tactual sensations are not connected with impressions of sight: if these sensations suggest the ideas of magnitude and figure, these qualities must belong to the sense of touch; if they do not suggest them, the fact is nearly decisive of the contrary position. A person ignorant of anatomy, and therefore having no visual ideas of the parts under the skin, would not form any notion of the size or figure of his liver from the sensations of touch, excited through its whole substance by inflammation; but if a scald occasion the inflammation of his finger or of any visible part of the skin, he will have a distinct idea of the size and form of the part affected: we may conclude, then, that this idea is derived from sight, as touch in the preceding instance was found incapable of giving any notion of the size or figure of the inflamed part.

It may be objected that the hand is the proper organ of touch, and that the sensations of the liver are not calculated to impart ideas of magnitude and figure. But the impact of a cube against the hand of a child who has never yet seen his

hand, and the impact of the cube against the coat of the stomach, seem equally incapable of giving any notion of magnitude or figure; and the superiority of the hand above other parts of the body, in suggesting those notions, is owing entirely to the more numerous visual ideas which our habits have connected with it. The hand is indeed the most convenient organ of touch; but if from accident other parts of the body are much exercised in its stead, we find that they acquire much of that delicacy of touch which is usually peculiar to the hand.

Spasms or inflammation will sometimes produce sensations of touch exactly resembling those occasioned by the contact of external objects. An acute spasmodic affection will excite the tactual idea of a point, minute prickly spasms that of numerous points, and a duller diffused spasm that of a curved surface. Suppose that such sensations of touch were experienced by an infant anterior to all impressions of sight, can it be thought that from them he would derive any notion of figure? If he would not, touch is incompetent to suggest the notion of figure; and whenever it seems to introduce that notion into the mind, we may be assured that it has acted a subordinate part.

Touch is equally incompetent to excite the notion of position; if it could suggest position, it must also suggest combined position, and consequently figure; if it gave a notion of the situation of each part of an inflamed liver, it would give an idea of the whole figure.

If a person who has a pain in his back be desired to place his finger on that spot on the back of a statue which corresponds to that which he conceives to be the painful place in his own, he will hesitate long, and at last decide with much uncertainty: but if he turn his head so as to see a bruise on his back, which had been, unknown to him, the source of his pain, he will positively refer the pain to that spot, which will probably differ considerably from the one he had marked on the statue; thus the position is determined by an impression of sight, touch having been found incompetent to ascertain it.

A person who has lost a hand, often fancies that he feels

pain in a finger of that hand, and refers it to that place in the air which his finger would have occupied if he had not lost it. Nothing can more incontestibly prove the inadequacy of the sense of touch to mark position, since the touch or pain is here supposed to suggest its having position in a place where there is no part of the body existing.

I shall now endeavour to show that the idea of distance is acquired by the sense of sight alone, though not originally suggested by it.

For this purpose it will be necessary to enquire into a law of the understanding which, though it must have occurred in some of its modifications to all who have philosophized on the mind, has not been unfolded by any as its importance equires.

The two acts or states of the mind, called perception and idea, have a common nature. I was accustomed some years ago to the view of a street in London, into which my house looked. I now think of the same scene, which I can recall with ease and accuracy. My present notion of it differs from that which entered through the eye only in the superior vivacity and steadiness of the perception over the idea (all considerations of the idea of past time, and of the belief of outward existence, are here intentionally waved). When two perceptions have entered the mind together, or in immediate succession, the recurrence of the idea of one tends immediately to suggest the idea of the other. The same law obtains between perceptions and ideas: when I perceive a small part of an object which I have known familiarly, that perception instantly calls up the idea of all the other parts, and though I only see a part, I think of the whole. The perception and the recollection blend together, so as to form one homogeneous whole. Almost all that seems to be simple perception, is in fact the result of this process. Suppose any object, a chair for example, to be presented frequently to view, and allowed each time to continue in sight for the space of a second: it is plain that each separate perception is the same as that which preceded it, that as a mere perception of the sense the twelfth perception differs nothing from the eleventh, nor the eleventh

from any one that has gone before. Yet the picture of the object, after the first glimpse or two, is confused and faint; after the twelfth time it becomes clear and accurate. Something, therefore, must have coalesced and assimilated with the last perception to render it so much more correct and vivid; and that can only be the ideas, the reproduction or reminiscence of the preceding perceptions. Every perception of the object leaves behind it an idea which instantly coalesces with the subsequent perception. The last perception, blended with all the ideas derived from the antecedent ones, gives a full and distinct notion of the chair. It often happens that the perception is obscure and imperfect, compared with the antecedent kindred ideas; but deriving clearness and completeness from the accession of these, it becomes as useful for all the purposes of reasoning or life as the most perfect perception.

Hence the facility with which familiar objects are recognised. The slightest glance of a horse would give us a distinct idea of his form; but a single fleeting view of a Llama would give us the most imperfect notion of it. The latter perception is of the same duration, and from its novelty perhaps more vivid than the former; but the perception of the horse immediately absorbs, as it were, into itself, the numerous preceding ideas of that animal, or excites the mind to reproduce the past perceptions which blend with the present one; while the perception of the Llama, being conjoined with no antecedent ideas, is left to its own weakness and indistinctness.

Hence the singular acuteness with which men distinguish between objects with which they are particularly conversant. A shepherd will select a particular sheep from the most numerous flock. A seaman will descry a vessel on the bounds of the horizon, discern its size, shape, and rigging, determine of what national make it is, and whether it be for war or commerce, when a landsman, if he see any thing, can discover only a black spot. The shepherd and the seaman may be inferior to other men in their natural powers of sight, exercised upon objects with which they are not peculiarly conversant; but in their own departments they have a store of correct and assimilated ideas, which immediately arise at the call

of the faintest perception, and lend to it their fullness and vivacity. One used, for instance, to finding hares, looks into a brake, and spies part of the head and the tips of the ears of a hare: another person, unaccustomed to field sports, looks on the same spot and sees nothing but the tangling brambles. The optic powers and the actual perception were the same in both persons, but the peculiar shades and contours did not find in the mind of the latter any previous store of ideas, of the form and appearance of a hare, ready to blend with the faintest perception.

The same principle will be found to operate in most of those cases which are usually referred to a greater perfection of sense. The facility of recognition and distinction depends not on better sight, but on better memory, and on a consequent tendency to associate what is remembered with what is seen. Imperfect recognition is the difficulty of blending them.

Why does a painter discern more of the particulars of a picture than a person ignorant of the art? Not from the superior rapidity of examination which he has acquired by habit, for it will still be the case if he does not permit his eye to roll, and at the first glance, when the impression on his eye must be the same with that on the eye of another man, but his mind is filled with a thousand lively ideas which crowd into every picture upon the slightest impulse of association.

Why do we perceive so much more quickly and correctly objects of which we have been in expectation, than others? Because the effect of expectation is to keep up lively ideas of the object expected, which, coalescing immediately with slighter perceptions than would be otherwise noticed, form a complete notion of it.

It is indeed chiefly in consequence of this coalition of idea with impression, that the operations of the mind and the business of human life are carried on with facility and dispatch. If it were not for this law, every view of an external object would be attended with all the labour, and protracted to all the length, of a first examination. Experience would be in a great measure useless, and on every new examination of an

object, we should have to study it as if it were for the first time. But in consequence of this law, the slightest and shortest impression on the senses is sufficient in all familiar cases. The least spark lights up the train of associated ideas. Perception becomes a language, of which the chief use is to excite the correspondent series of thought, and the senses are seldom intensely and long employed but in the examination of new objects. The far greater part of what is supposed to be perception is only the body of ideas which a perception has awakened. If, from particular circumstances, our preconceptions, or those accumulated antecedent ideas, are uncommonly vivid, the slightest incident is sufficient to recall them, and every new impression that bears the remotest similitude to the original, will revive the whole train of sensations: if, for example, a man come to an interview, in very anxious expectation of a friend, he will sometimes for a moment mistake a mere stranger for the expected friend. After living a week in the centre of a deer-park, I took the first flock of sheep I saw for deer. A peasant, whose mind is well stored with tales of ghosts, sees a female figure clothed in white, in a stone or a cow. In these cases the previous ideas modify the perception so as to produce mistake, usually referred to the senses, but which is really referable to the mind. In the approaches, and still more under the influence of insanity, an idea may predominate so strongly as to assimilate to itself every perception to which it bears the most distant resemblance. In Irwin's voyage on the Red Sea, we read of a young man whose mind was so constantly haunted by the dread of assassination by the Arabs, that, looking one day earnestly at the bottom of the boat, he exclaimed, "the darts of the Arabs;" nor could he be convinced that what he saw were merely reeds. Such was the first indication that he gave of mental derangement.

These observations will be sufficient to prove the homogeneousness of perceptions and ideas, and their capacity of being thoroughly blended so as to form one whole. The principle is implied, though not unfolded, in Berkeley's own Theory of Vision, for it supposes the ideas of objects derived from touch

to be excited by the perceptions which enter through the eye, and the idea to be so constantly associated with the perception, that they never can be separated. But its importance deserves that it should be distinctly considered as one of the principal of the secondary laws of thought; and that importance will appear to be still greater, if I am successful in deducing from it a new and more probable theory of the acquired perceptions of sight.

It has already been said, that superficial distance (or space considered merely in length and breadth,) is an original object of vision. It must indeed be as much so as colour, since it is manifestly inconceivable that we should see unextended colour. Figure is bounded extension; and these three perceptions, namely, colour, superficial extension, and superficial figure, are the three coeval and inseparable perceptions of sight, which must have entered the mind together on the first exercise of the faculty of vision, and which can never be imagined to exist separate from each other. The generally received doctrine, that distance is not an original object of sight, is ambiguously expressed. As superficial space is an original object of sight, so must the distance between two points which (to borrow an expression from subsequent experience,) are in the same plane; otherwise one circle would not originally appear larger than another. That which is not an original object of vision, is distance from the eye or outness, and the manner in which we acquire this notion is the object of the present enquiry.

A child has at first no conception that any part of the picture presented to his eyes is composed of his own figure. He views his hand, body, or foot, with the same interest as the trees, stones, &c. He has no idea of sentience connected with one object more than another, nor a thought like what he afterwards acquires, that he is himself present in one part of the picture from which the distances of the rest are measured.

The notion of his person is acquired by observing that sensation is always connected with certain parts of the picture, and that those parts never vary like the others in distinctness, size, colour, &c. His own figure is then made up of a certain

observed portion of the picture, which is a constant uniform unvarying object in every different picture of objects which are unceasingly changing their aspects.

Let us now suppose him to look at his finger, held in that position in which all the parts of it are at nearly an equal distance from the eye. He repeats the observation so often that he acquires a full notion of the superficial distance of all the parts of the finger from each other. Suppose the finger then to be placed somewhat obliquely, the more distant parts of its surface will make a smaller impression on the eye (that is, will subtend a less angle,) than they did before. But the idea of these more distant parts, gained from former observation, will be immediately excited. This idea will correct the impression made on the sense, and thus the more distant parts will seem to be as large as before the finger was moved into an oblique position. When the child has looked often enough at all the parts of his finger, a glimpse of one part of its surface will excite the ideas of all the other parts of it. After a thousand views of the finger in all directions, he never looks at one side without synchronous ideas of the other side; it is hardly observable where impression ends and idea begins. He cannot see the knuckles in a fore-shortened view, without synchronous ideas of the parts interjacent (for they are like the further side of the finger in the preceding case, parts now unseen, but of which there are familiar ideas in the mind,) and he cannot have these ideas of the interjacent parts, without imagining the knuckles at something like their real distance from each other: this gives outness or distance from the eye, which differs from superficial distance only in this respect, that the eye must be considered as one of the points between which space is extended.

A child believes his finger in all views to be the same object, because he never has a new impression of it without some recognised part of a former impression along with it, and also some idea of parts obscure and unseen.

If the more simple parts of this process are distinctly apprehended, there will be no difficulty in conceiving those which are more complicated.

I look at a globe. No more of it than one hemisphere can be the direct object of vision. But I have no separate notion of the hemisphere: I think of the hemisphere I have before seen as soon as I discern the one which I now see. The idea of the invisible part of the globe instantaneously blends with the perception of that which is visible, and they jointly form my notion of the globe.

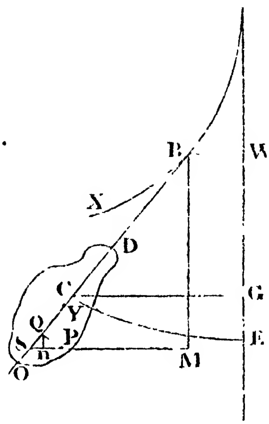
There is a certain distance from the eye at which an object must be placed, in order that it may be most distinctly seen. This is the nearest distance at which the eye can distinctly take in the whole object: when the object is brought nearer, the eye sees only a part of it; when it is removed to a greater distance, the impression on the sense is smaller. This is the largest possible view of the object, and that which leaves behind the fullest and clearest idea of it. This perception is in other respects of such importance, that the mind naturally recurs to it more frequently than to any other. The idea then of the object seen at this distance is in itself the most full and distinct, and is associated with the greatest number of other ideas, as well as with the strongest emotions.

Here then is a visual idea of an object which may be substituted for the tangible magnitude of Berkeley. This idea furnishes what we call the real magnitude of the object. All the other perceptions of the object being comparatively indistinct and uninteresting, are chiefly useful in calling up this idea. Thus a standard visual idea of every object is formed, which instantly blends with every fugitive perception, and corrects it. A visual perception is a sign which excites the standard visual idea, and the whole of that process is performed by the sense of sight alone, for which Berkeley called in the assistance of the sense of touch.

Art. II. *On Pendulums vibrating between Cheeks.* By Benjamin Gompertz, Esq.

The application of a pendulum to the measure of time, has long been considered to be a subject worthy of the attention of the philosopher, and the theory of the vibrating pendulum, has in consequence long been studied by men of science, and has enabled them to present to the world at large, beautiful proofs of the value of mathematical and philosophical researches. But the study of the pendulum does not only offer highly useful information for the common purposes of life, and by that means, bestow convenience on men who unfortunately as well for themselves as for the cultivators of knowledge, are ignorant of any other measure of the value of science, than the scale of interest; but it adds to the intellectual store of the philosopher, property which he alone knows to appreciate, and which is so much the more to be valued, as the intellect of the philosopher is too frequently the only riches he possesses. The great Huygens, in his application of the pendulum to a clock, considering that a body would move through all arcs of the same cycloid whose axis is perpendicular to the horizon in the same time, and knowing the property of describing a cycloid, by unwinding a string of a certain length from another cycloid, conceived the idea of constructing tantochronic pendulums, or such as will complete their vibrations, whether great or small, in the same time, by causing pendulums during their vibrations to bend about and unbend from cycloids called cycloid cheeks; many have since attempted to reap the benefit of this theory; but difficulties have been found in the mechanical execution of it; and it is my object in the sheets I have now the honor to lay before the public, to consider the real effect of cheeks about which pendulums are required to vibrate, when such pendulums are not considered to be different from their real nature, or in other words, when they are not considered to be points.

Fig. 1.



PROBLEM I.

The body PCDQS vibrates in a vertical plane, being hung on a thread ABD, which as the body vibrates, winds about the curve ABX; and it is here proposed to determine the circumstances relating to the motion, proper data being supposed given. *The part BD below the point where the thread leaves the curve, being supposed a right line passing through the centre of gravity C of the body,* the resistance of the air not being taken into consideration?

Let v be the velocity at a certain time of a particle P of the body, in the direction PM parallel to the horizon; let u be the velocity at the same time of the same particle P, in the direction parallel to BM, which is perpendicular to the horizon; and let $2g$ be the absolute force of gravity, consequently $P\dot{v}$ is the fluxion of the momentum generated in P by the inertia of the system in the direction PM; and $\dot{t}$ representing the fluxion of the time $\dot{u}P - 2gP\dot{t}$ will represent the fluxion of the momentum generated in P in the direction BM by the inertia of the system; but because the system by its inertia cannot put itself in motion or destroy any motion which it might have, it follows that the whole of these forces in the system must destroy each other. Furthermore, supposing B

the point at this instant where the thread ABX leaves the cheek; this point B will be the momentary centre of motion about which all the particles revolve, and through the medium of which, as a fulcrum, the effect of any particle P may, by the power of the lever, be transferred to any point C of the body; and consequently by the property of the lever, because the above named forces destroy each other, we have I, the sum of $\overline{(\dot{v} \,.\, P \,.\, BM)}$ + the sum of $(\dot{u}\, P - 2\, g\, P \,.\, \dot{t} \,.\, MP) = o$. Draw PQ I BC cutting $\dot{u}$ in Q, produce PM to cut BD in S, and draw $Qn \perp SM$, cutting SM in n; therefore $PM = BQ$. cos of the angle BSM — PQ × sine of the angle BSM: and if V be the ahsolute velocity of the centre of gravity C of the body, it is evident we should have, whilst B is the momentary centre, BC:V::BM: the velocity of M or its equal the velocity of P in the direction PM that is v; and therefore $BM = \frac{BC}{V} . v$; also we have $BC:V::PM:u$; and consequently $PM = \frac{BC \,.\, u}{V}$, consequently equation I becomes sum of $\frac{v\dot{v} . BC}{V} P)$ + sum of $\left(\frac{u\dot{u} \,.\, BC}{V}\right) . P - 2g . P . \dot{t} . MP) = o$; and ∴ II; sum of $v\dot{v}\, P$ + sum of $u\dot{u}\, P$ = sum of $2g\, P\, \dot{t}\, V . \frac{MP}{BC}$; but sum $v\dot{v} \;.\; P + u\dot{u}\; P = \frac{1}{2}$ fluxion of sum of $(v^2 . P + u^2\, P =$ $\frac{1}{2}$. fluxion of sum of $\left(\frac{V^2 \,.\, BM^2 \,.\, P}{BC^2} + \frac{V^2 \,.\, PM^2 \,.\, P}{BC^2}\right) =$ $\frac{1}{2}$. fluxion of sum of $\frac{V^2 . BP^2}{BC^2} = \frac{1}{2}$. fluxion of $\left(V^2 .\right.$ sum of $\left.\frac{BP^2}{BC^2}\right) =$ (because C is the centre of gravity of the body, and supposing a be put for the sum of $\frac{CP}{BC^2}$. P in the body, and the body be called 1,) $\frac{1}{2}$. fluxion of $\overline{\left(1 + \frac{a}{BC^2}\right) V^2}$; also sum of $2g \,.\, P\dot{t} \,.\, V . \frac{PM}{BC}$ = (by substituting for PM its value BQ . cos of BSM — PQ . sine of BSM found above) $2g\, \dot{t}$ cos of BSM . V; because C is the centre of gravity and in consequence sum of $BQ . P = BC$, the body being 1 and the sum of $PQ = o$.

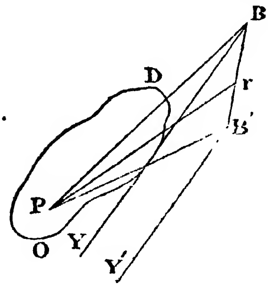
Hence equation II becomes III, fluxion of $\overline{1+\frac{a}{BC^2}\cdot V^2} = 4g\dot{t}\,.\,V$ cos of S. Let AE cutting the path CE of the centre of gravity C of the body, in E, be a line given in position $\perp$ to the horizon; draw CG parallel to the horizon cutting AE in G, put EG $= x$ GC $= y$ EC $= z$ R $=$ BC; and consequently because BC is perpendicular to the curve CE at C, the cosine of the $<$S or its equal the cosine of BCG $= \frac{\dot{x}}{\dot{z}}$, and $\dot{t}$ is $= \frac{\dot{z}}{V}$ whilst C descends; consequently the equation III becomes fluxion of $\left(\overline{1+\frac{a}{R^2}}.V^2\right) = -4g\dot{x}$, and therefore $\overline{1+\frac{a}{R^2}}.V^2 = 4g\,.\,\overline{b-x}$, b being the value of x when V $= o$, consequently

$$V = \sqrt{4g\,.\,\frac{b-x}{1+\frac{a}{R^2}}} \text{ and } \dot{t} = -\frac{\dot{z}}{\sqrt{4g\,.\,\frac{b-x}{1+\frac{a}{R^2}}}}$$

We might here proceed in the subject in hand; but as I am not aware that any one has gone before me in this speculation, I consider it more satisfactory to have the corroborative evidence of a second investigation, and for this object I shall propose the following Lemma, which will be found worthy of consideration for other purposes as well as for this now in view.

Lemma. If a body OPD, fig. 2. after having been put in motion, move in virtue only of its inertia, and by some mechanism is continually changing its centre of motion, by continued and gradual, or in other words not sudden change, then I say the velocity of the centre of gyration of the body, corresponding to the point about which it may then be revolving, will be a constant quantity; that is the same as the velocity of any other point in the body, at the time when it is the centre of gyration, corresponding to the point about which it is at this other time revolving.

Fig. 2.



Let B be the centre about which the body is revolving at a certain instant, B′ infinitely near B be the centre about which it revolves the next instant, bisect BB′ in r, and from every point P of the body, draw PB, Pr and PB′, let w be the angular velocity of the body in the first instant, measured at the distance 1, and the momentum of P will be $w . P . PB$ when it revolves about B, which is divisible into two, the one in the direction B′P, and the other perpendicular thereto, and which is $= w . P . PB$. cos of the angle BPB′, or omitting quantities infinitely small of the second degree simply $w . P . PB$ the former of these forces when B′ becomes the centre is destroyed by the reaction of B′, and the other gives to P the angular momentum $w . P . PB . PB' = w . P . Pr^2$, neglecting infinitely small quantities of the second degree, consequently the whole angular momentum of the body $= w$ sum of $(P . Pr^2)$; Let Y be the centre of gyration of the body when it revolves about B, and Y′ the centre of gyration of the body when it revolves about B′, consequently, $BY^2 = \dfrac{\text{sum of } BP^2 . P}{\text{body}} =$, neglecting infinitely small quantities of the second degree, (Sum of $Pr^2 . P$ + sum of ($2\,Br . Pr . P$ cos of r)) $\div$ body $=$ (sum of $(Pr^2 . P)$ + $2\,Br$. sum of $Pr . P$. cos of r)) $\div$ body : in the same way we find $B'Y'^2 =$ (sum of $(Pr^2 . P) - 2 . Br$. sum of $Pr . P$. cos of r)) $\div$ body; $\therefore$ $B'Y'^2 . BY^2 = (\overline{\text{sum of } Pr^2 . P}|^2 - 4\,Br^2 . (\overline{\text{sum of } Pr . P . \text{cos of } r}|^2) \div \overline{\text{body}})^2$; or neglecting the term of which Br^2 is the coefficient, it being infinitely small of the second degree, we find $B'Y'^2 . BY^2 = \dfrac{\overline{\text{sum of } \overline{Pr}|^2 P}|^2}{\overline{\text{body}}|^2}$;

$\therefore$ B′Y′. BY $= \dfrac{\text{sum of } Pr^2 . P}{\text{body}}$; consequently the angular momentum of the body which was above shown to be w. sum of P Pr^2 is equal to w. body $\times$ B′Y′. BY, when the body revolves about B′; and Y′ being the centre of gyration corresponding, the velocity of Y′ will be the said angular force divided by B′ Y′. into the body, and is consequently w. BY or the velocity which Y had when the body revolved about B, and therefore, the fluxion of the velocity being equal to nothing the velocity is constant QED. The above is not the only proof the lemma admits of, and the truth is likewise corroborated by the principal of vis-viva.

Hence to a second solution of the Problem. See Fig. 1.

Let O be the centre of oscillation, and Y the centre of gyration of the body corresponding to the centre of suspension B; $\therefore$ the velocity of Y $=$ V. $\dfrac{\text{BY}}{\text{BC}} =$ by the known expression for the distance of the centre of gyration from the point of suspension) V. $\sqrt{\dfrac{\text{BO}}{\text{BC}}} =$ V. Q, Q being put for $\sqrt{\dfrac{\text{BO}}{\text{BC}}}$; $\therefore$ from the lemma were it not for gravity we should have V. Q a constant quantity, or $\dot{V}Q + V\dot{Q} = o$; that is $\dot{V} = -\dfrac{\dot{Q}V}{Q}$, and consequently the excess of the real value of $\dot{V}$ above this value, must be generated by gravity: but gravity would generate in C, the velocity $2g\,\dot{t}$. cos of C . $\dfrac{\text{BC}}{\text{BO}}$ that is $-\dfrac{2g\dot{x}}{V . Q^2}$;

$$\therefore \dot{V} + \frac{\dot{Q}V}{Q} = -\frac{2g\dot{x}}{V . Q^2}, \text{ and therefore } V\dot{V}Q^2 + \dot{Q}Q . V^2 =$$

$-2g\dot{x}$; and $\therefore V^2 Q^2 = 4g . (b-x)$ and $V = \sqrt{4g . \dfrac{b-x}{Q^2}} =$

$\sqrt{4g . \dfrac{b-x}{1 + \dfrac{a}{R^2}}}$ the same as before.

And consequently when the curve described by C is given, the time describing any part of it may be formed; but it may be more convenient in case the cheek ABX fig. 1, is

given to have the expression of time immediately from that, in order to which, put AB $=$ Z, AW $=$ X, BW $=$ Y, AE $=c$; $\therefore$ BC $= c - Z$, and cosine of $<$ BCG $= \frac{\dot{x}}{\dot{z}}$, and likewise $= \frac{\dot{Y}}{\dot{Z}}$; and $\therefore \dot{z} = \dot{Z} \times \frac{\dot{x}}{\dot{Y}}$; also x or AE $-$ AW $-$ WG $=$ $c - X - (c - Z)\frac{\dot{X}}{\dot{Z}}$; $\therefore \dot{x} = -\dot{X} - (c - Z) \cdot \frac{\ddot{X}\dot{Z} - \dot{X}\ddot{Z}}{\dot{Z}^2}$ $+ \dot{X} = -(c - Z)\frac{\ddot{X}\dot{Z} - \dot{X}\ddot{Z}}{\dot{Z}^2} \therefore \dot{t} = (c - Z) \cdot \frac{\ddot{X}\dot{Z} - \dot{X}\ddot{Z}}{\dot{Y}\dot{Z}} \div$

$$\sqrt{4g^2 \frac{b - c + X + (c - Z)\frac{\dot{X}}{\dot{Z}}}{1 + \frac{a}{\overline{c - Z}|^2}}} = \frac{\left(\overline{c - Z}|^2 + a\right)^{\frac{1}{2}} \cdot \frac{\ddot{X}\dot{Z} - \dot{X}\ddot{Z}}{\dot{Y}\dot{Z}}}{\sqrt{4g \cdot \left(b - c + X + (c - Z)\frac{\dot{X}}{\dot{Z}}\right)}}$$

in which one of the two $\dot{X}$, $\dot{Z}$ may be taken constant.

If the equation of the cheek is $eX = eZ - Z^2$ it will be a cycloid convex to the horizon passing through A, whose axis is perpendicular to the horizon, the diameter of its generating being $\frac{1}{4}e$; and we shall have $\dot{X} = \dot{Z} - 2\frac{Z\dot{Z}}{e}$, $\therefore \frac{\dot{X}}{\dot{z}} = 1 - 2\frac{Z}{e}$, $\frac{\ddot{X}\dot{Z} - \ddot{Z}\dot{X}}{\dot{z}} = -2\frac{\dot{Z}^2}{e}$, $\dot{Y} = \dot{Z}\sqrt{4\frac{Z}{e} - 4\frac{Z^2}{e}}$, consequently $\dot{t} = \frac{\left((c - Z)^2 + a\right)^{\frac{1}{2}} \times -\dot{Z} \cdot \overline{e Z - Z^2}|^{-\frac{1}{2}}}{\sqrt{4g\left(b - c + Z - \frac{Z^2}{e} + \overline{c - Z} \cdot \overline{1 - 2\frac{Z}{e}}\right)}} =$

$$\frac{\left(c - Z\right)^2 + a\big)^{\frac{1}{2}} \times -\dot{Z}}{\sqrt{4g \cdot \left(b - 2\frac{c}{e}Z + \frac{Z^2}{c}\right)}\sqrt{eZ - Z^2}},$$ or because $eZ - Z^2 = eX$,

$Z = \frac{1}{2}e - \sqrt{\frac{1}{4}e^2 - eX}$ and $\dot{Z} = \frac{\frac{e}{2} \cdot \dot{X}}{\sqrt{\frac{1}{4}e^2 - X}}$ we have $\dot{t} =$

$$\frac{\sqrt{a+\left(c-\frac{1}{2}e+\sqrt{\frac{1}{4}e^2-eX}\right)^2}\times-\frac{e}{2}\frac{\dot{X}}{\sqrt{eX}\sqrt{\frac{1}{4}e-X}}}{\sqrt{4g\left(b-X+\frac{e-2c}{e}\times\left(\frac{1}{2}e-\sqrt{\frac{1}{4}e^2-eX}\right)\right)}},$$

because $-\frac{2cZ}{e}+\frac{Z^2}{e}=-Z+Z^2+\frac{e-2c}{e}.Z$, and if t represent the time of one half vibration, the fluent will be to be taken between the limits of $b-X+\frac{e-2c}{e}\times\overline{\frac{1}{2}e-\sqrt{\frac{1}{4}e^2-eX}}$ being $=o$ and $=b$. If a and $e-2c=o$ this becomes the usual case of the cycloid, and $\dot{t}$ becomes $=$

$$\frac{-\frac{e}{2}.\dot{X}}{\sqrt{4g.e\,(bX-X^2)}}$$

and the fluent will be to be taken between the limits $X=b$ and $=o$, this will evidently give tantochronism for all values of b, as b will not enter, but in the true case of the problem, the thing is different. I believe a more convenient form would be obtained by putting $2cZ-Z^2=\varrho$ which by the bye is $=ex$, and supposing $Z=o$ when $\varrho=o$: which gives $Z=c-\sqrt{c^2-\varrho}$, the negative sign being necessarily prefixed to the radical quantity in order to fulfil the condition of $Z=o$ when $\varrho=o$; this gives $\overline{c-Z}|^2=c^2-\varrho$

$\therefore\dot{Z}=\frac{\frac{1}{2}\dot{\varrho}}{\sqrt{c^2-\varrho}}$, and putting $h=e-2c$, $eZ-Z^2=2cZ-Z^2+hZ=\varrho+h.(c-\sqrt{c^2-\varrho})$, and consequently $\dot{t}=$

$$\frac{\sqrt{\overline{c^2-\varrho+a}}\times-\frac{1}{2}\dot{\varrho}\,\overline{c^2-\varrho}|^{-\frac{1}{2}}}{\sqrt{4g.\overline{b-\frac{\varrho}{e}}}\sqrt{\varrho+h.(c-\sqrt{c^2\varrho})}}.$$

If we suppose c great in comparison to ϱ, $c-\sqrt{c^2-\varrho}$ may be written $\frac{1}{2}\frac{\varrho}{c}+\frac{\varrho^2}{2.4.c^3}+\frac{3\varrho^3}{2.4.6.c^5}$, &c., and therefore $\varrho+h.(c-\sqrt{c^2-\varrho})=$

$\frac{1}{2}\cdot\frac{e}{c}\varrho+\frac{h\varrho^2}{2.4.c^3}+\frac{3h\varrho^3}{2.4.6.c^5}$ &c. and therefore $\left(\varrho+h.\left(-c\sqrt{c^2-\varrho}\right)\right)^{-\frac{1}{2}}$

$$=\frac{1}{\sqrt{\frac{1}{2}\frac{e}{c}\cdot\varrho}}\times\overline{1+\frac{h\varrho}{4c^2e}+\frac{3h\varrho^2}{4\,.\,6\,.\,c^4c}\text{ &c.}}\Big|^{-\frac{1}{2}}=\frac{1}{\sqrt{\frac{1}{2}\frac{e}{c}\varrho}}$$

$$\times\left(1-\frac{h\varrho}{2.4.e.c^2}-\left(\frac{3h}{2.4.6.e.c^4}\cdot-\frac{1.3.h^2}{2.4.16.e^2.c^4}\right)\varrho^2\text{ &c.}\right);\text{ also}$$

$$\sqrt{c^2-\varrho+a}\times(c^2-\varrho)^{-\frac{1}{2}}=\sqrt{1+\frac{a}{c^2-\varrho}}=\sqrt{1+\frac{a}{c^2}\times\left(1+\frac{\varrho}{c^2}+\frac{\varrho^2}{c^4}\text{&c.}\right)}$$

$$=\sqrt{1+\frac{a}{c^2}}\times\sqrt{1+\frac{a}{c^2+a}.\times\overline{\frac{\varrho}{c^2}+\frac{\varrho^2}{c^4}\text{ &c.}}}=\sqrt{1+\frac{a}{c^2}}+\frac{1}{2}$$

$$\cdot\frac{a}{c\sqrt{c^2+a}}\cdot\frac{\varrho}{c^2}+\left(\frac{1}{2}\frac{a}{c\sqrt{c^2+a}}-\frac{1}{2.4}\cdot\frac{a^2}{c.\overline{c^2+a}|^{\frac{3}{2}}}\right)\frac{\varrho^2}{c^4}\text{ &c. conse-}$$

quently $\dot{i}=-\frac{\frac{1}{2}\dot{\varrho}}{\sqrt{\frac{2g}{c}\left(be\,.\,\overline{\varrho-\varrho^2}\right)}}\times$

$$\left\{\begin{array}{l}\left\{\begin{array}{l}\sqrt{1+\frac{a}{c^2}}+\frac{\frac{1}{2}a}{c\sqrt{c^2+a}}\\ \qquad-\frac{h}{2.4.e}.\sqrt{1+\frac{a}{c^2}}\end{array}\right\}.\frac{\varrho}{c^2}\\ +\left\{\begin{array}{l}\left(\frac{\frac{1}{2}a}{c\sqrt{c^2+a}}-\frac{1}{2.4.c}\cdot\frac{a^2}{\overline{c^2+a}|^{\frac{3}{2}}}\right)\\ \qquad-\frac{h.a}{2.2.4.ec\sqrt{c^2+a}}\\ \qquad-\sqrt{1+\frac{a}{c^2}}\left(\frac{3h}{2.4.6.e}-\frac{3h^2}{2.4.16.e^2}\right)\end{array}\right\}.\frac{\varrho^2}{c^4}\text{ &c.}\end{array}\right\}$$

or putting $\frac{1}{2}\frac{\sqrt{1+\frac{a}{c^2}}}{\sqrt{\frac{2g}{c}}}=A$; and B, C &c. for the above co-

efficients of ϱ, ϱ^2 &c. when multiplied by $\frac{\overline{2}}{\sqrt{\frac{2g}{c}}}$ we have $t =$

$\frac{\varsigma}{\sqrt{be\varrho - \varrho^2}} \times \overline{A + B\varrho + C\varrho^2 + \&c.}$; and the whole fluent of this between the limits of $\varrho = bc$ and $\varrho = o$ being the time of one half vibration, is $p \times (A + \frac{1}{2} B \,.\, be + \frac{1.3}{2.4} C \,.\, b^2 e^2$ &c.) p standing for the semiperiphery of a circle whose radius is unity.

Here we observe that A, B, C do not contain b; and therefore that in the usual case of the cycloid; that is when the vibrating body is considered to be a point, and the length of the cycloid cheek reckoning from A to the diameter of the cycloid, is equal to the length of the pendulum; B, C, &c. will be equal to o; and we shall consequently have t the same whatever b is; but when B, C, &c. are not equal to o tautochronism is not produced by the cycloid cheek, and this being the real case of nature, we see no reason why the cycloid cheeks should be used for the purpose for which they were invented. Here, however, it is necessary to remark, that in the enunciation of the problem to which we have now been giving a solution, it is required that the part BD below the point where the thread leaves the curve shall be a right line passing through the centre of gravity C of the body, but whether that would be the case in Huygens' construction, does not interfere with this solution, and a mechanical construction might be given to produce the effect: indeed I shall show further on, that the common construction would not admit of it, and that in consequence a point in the pendulum which may have, according to that construction, been supposed to describe a cycloid, does not. Retaining the enunciation of the problem, I observe that we have the power of choosing such a cycloid cheek that B may vanish, that is by taking $a = \frac{h}{4 \,.\, e} \,.\, (c^2 + a)$ that is $= \overline{1 - 2\frac{c}{e}} \,.\, \frac{c^2 + a}{4}$, and $\therefore e =$

$\frac{c^2+a}{c^2-5a} \cdot 2c$; by this means, when the arc of vibration is small, it is plain that this cycloid cheek would answer better than a centre, but other curves might be found to answer the same purpose, and better; it is further worthy of remark, that this cycloid is not the same as would suit a pendulum, considered to have the matter concentrated in the centre of oscillation corresponding to the full length of our pendulum, for that would require c to be $= \overline{1+\frac{1}{a}} \cdot 2c$. This remark may interfere with the determination of the length of a pendulum for universal measure, a subject of present public consideration.

But as the subject of tautochronism is an object interesting to the scientific man and to the public at large, and has been long a favorite topic of the mathematician, I presume, that having shown that the cycloid cheek which has, I believe, hitherto been considered, the proper means of attaining it, independent of the resistance of the air, does by no means accomplish the end, the analyst will not object to peruse the following investigation of the true curve the centre of gravity of a body ought really to describe for that purpose under the restrictions of Problem I., and for this end I shall propose by way of Lemma the investigation of an analytical problem which may be found useful in other purposes, and which is something more general than is required for our present object.

PROBLEM II.

"Having $\dot{A} = \dot{u} \cdot \overline{b-x}|^p$ it is proposed to find u a function of x, such that A may be $= o$ when $x = b$; and $A = k$ when $x = o$: b and p being constant quantities, k and u independent of b, and the sum of the infinite series $\frac{1}{p+1} + \frac{p+1}{p+2} + \frac{\overline{p+2}}{2} \cdot \frac{p+2}{p+3} + \frac{\overline{p+1} \cdot \overline{p+2} \cdot \overline{p+3}}{2 \cdot 3 \cdot p+4}$ &c. finite?

Solution Suppose $\dot{u} = \dot{x} f(x)$; f standing for the characteristic of an operation or function to be found: then because $x = b -$

$(b-x), \dot{u} = \dot{x} f(b-(b-x)) = \dot{x} f(b) - (b-x)\dot{x} f'(b) + (b-x)^2 \dot{x}$ $f''(b)$ &c.; f', f'' &c. being characteristics of functions; therefore $\dot{A} = \dot{x} f(b) . \overline{b-x}|^p - \dot{x} f'(b) . (b-x)^{p+1} + \dot{x} f''(b) . (b-x)^{p+2}$ &c.; and $A = -f(b) . \frac{\overline{b-x}|^{p+1}}{p+1} + f'(b) . \frac{\overline{b-x}|^{p+2}}{p+2} -$ $f''(b) . \frac{\overline{p-x}|^{p+3}}{p+3}$, &c. which according to the requisite of the problem as A is $= o$ when $x = b$ does not require correction; therefore when $x = o$ A which is then to be $= k$ is $= -f(b) . \frac{b^{p+1}}{p+1} + f'(b) . \frac{b^{p+2}}{p+2} - f''(b) . \frac{b^{p+3}}{p+3}$ &c. we have now to obtain the characteristic f, so that b vanishes from this equation, and we immediately perceive that we have only to take $f(b) = e . b^{-p-1}$, e being independent of b, this evidently makes b vanish from the first term of the right hand side of this equation, and from Taylor's Theorem it is known that if $f(b) = e . b$, that $f'(b) = -e . \overline{p+1} . b^{-p-2}$, $f''(b) = e . \frac{\overline{p+1} . \overline{p+2}}{2} . b^{-p-3}$, and that consequently the above value of k is $= -e . \left(\frac{1}{p+1} + \frac{p+1}{p+2} + \frac{p+1}{2} . \frac{p+2}{p+3} \text{\&c.}\right)$ and $\therefore e = \frac{-k}{\frac{1}{p+1} + \frac{p+1}{p+2} + \frac{p+1}{2} . \frac{p+2}{p+3} \text{\&c.}}$. But if $f(b)$ $= eb^{-p-1}$, then $f(x) = e . x^{-p-1}$ and $\therefore \dot{u} = e\dot{x} . x^{-p-1}$ and $\therefore u = n - e \frac{x^{-p}}{p}$ n being a constant quantity QEI.

As the demonstrations of our result will be to many easier to follow than the above investigation, I shall insert it; it is as follows:

u being $= n - \frac{ex^{-p}}{p}$ it follows that $\dot{A} = e\dot{x} . x^{-p-1} \overline{b-x}|^p$; put $b - x = y$, and $\therefore$ $\dot{A} = -e\dot{y} y^p \overline{b-y}|^{-p-1} = \dot{y} e b^{-p-1} \dot{y} y^p$

$\times (1 + \overline{p+1} \cdot \frac{y}{p} + \frac{p+1}{1} \cdot \frac{p+2}{2} \cdot \frac{y^2}{b^2} +$ &c.) and therefore

$$A = -eb^{-p-1} \times \left(\frac{y^{p+1}}{p+1} + \frac{p+1}{p+2} + \frac{y^{p+2}}{b} + \frac{p+1}{2} \cdot \frac{p+2}{p+3} \cdot \frac{y^{p+3}}{b^2} \text{ \&c.} \right)$$

requiring no correction, because it gives $A = o$ when $x = b$ that is when $y = o$; and consequently when $x = o$ that is when $y = b$, $A = -e \times \left(\frac{1}{p+1} + \frac{p+1}{p+2} + \frac{p+1}{2} \cdot \frac{p+2}{p+3} \text{ \&c.} \right)$ that is substituting for the value of e its value given above, $= k$, QED. Hence the solution of Problem III.

Required the path described by the centre of gravity C of the body PCDQ, see fig. 1, moving as represented in Problem I. (the cheek ABX being not given, but depending on the nature of the required path) such that the vibrations may be tautochronic?

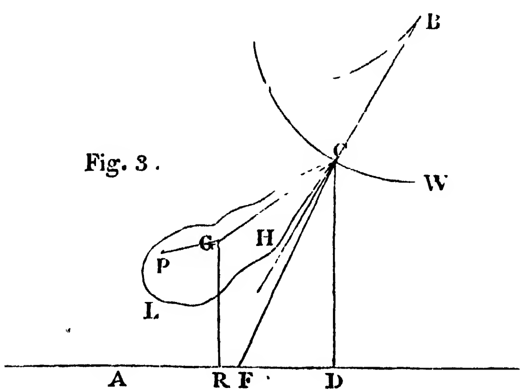
Solution. Because from Problem I. $\dot{t} = \frac{-\dot{z}}{\sqrt{4g \cdot \frac{b-x}{1+\frac{a}{R^2}}}}$ we have to find the nature of the curve such that t may be $= o$ when $x = b$. and t, for instance equal to k when $x = o$ whatever b may be; comparing this with the last problem we have $A = t$, $\dot{u} = -\frac{\dot{z}}{\sqrt{4g}} \sqrt{1 + \frac{a}{R^2}}$ and $\dot{A} = \dot{u} \cdot \overline{b-x}\Big|^{-\frac{1}{2}}$ $\therefore p = -\frac{1}{2}$ and the series $\frac{1}{p+1} + \frac{p+1}{p+2} + \frac{p+1}{2} \cdot \frac{p+2}{p+3}$ &c. $= \frac{2}{1} + \frac{1}{3} + \frac{1.3}{4.5} + \frac{1.3.5}{4.6.7} + \frac{1.3.5.7}{4.6.8.9}$ &c. or half the circumference of a circle whose radius is unity $= 3,14159$ &c. and, therefore, by the last problem

$\dot{u} = -\frac{k}{3,14159, \text{ \&c.}} \times \dot{x}x^{-\frac{1}{2}}$, and therefore the equation of the curve putting $\frac{k\sqrt{4g}}{3.14159 \text{ \&c.}} = \sqrt{d}$, is $\sqrt{\frac{d}{x}}\,\dot{x} = \dot{z}\sqrt{1 + \frac{a}{R^2}}$

in which if $\dot{x}$ be constant R is equal to $-\frac{\dot{z}^3}{\dot{x}\ddot{y}}$. If the vibrating

body be but a point, a will be equal to o, and we shall then have $\sqrt{\frac{d}{x}}\,\dot{x} = \dot{z}$ which is the equation to the cycloid. In what has gone before, I have supposed by the effect of mechanical construction if necessary, the part BD below the point where the thread leaves the cheek to be a right line passing through the centre of gravity of the body; because the received theory of the pendulum vibrating between cycloid cheeks is derived from certain notions connected with the requisite, that the weight does not move about the point D, where it is fastened to the thread; mechanical constructions might be pointed out which would answer this requisite in theory, and we have above shewn, that that requisite being accomplished, still the received theory of the vibrating pendulum moving between cycloid cheeks, if the body have any magnitude, as in nature it must have, would not be correct, there therefore appears to me an interesting enquiry with regard to this subject, which is, whether Huygens' construction without other mechanical contrivance, namely, if the weight be merely hung between the two cheeks by a silken thread bending about them would in its vibrations have the property of not moving about D as a centre? the consideration of this enquiry now follows, G being the centre of gravity of the body whose point C moves in the groove or line. CW.

Fig. 3.



Let $CG = a$, $AR = x$ $RC = y$ $AD = X$, $DC = Y$, ARD being a right line parallel to the horizon, and GR, CD lines perpendicular thereto; t the time from the commencement of the motion, v the velocity of the centre of gravity G of the body in the direction AR, u the velocity thereof in the direction GR: ϱ the velocity of C in the direction CD, σ the velocity of C in the direction AD; M the reaction of the groove or line CW in the direction CD, N the reaction of the groove in the direction AD, g the accelerative force of gravity in one second of time. Here it is to be observed, that if BC bends about a given cheek, as long as the part of the thread BC below the cheek is a straight line, so long the point C will be found in a determinable line CW an involute of the cheek, and that instead of the thread and cheek we may suppose as I here do, the point C to move merely in a groove CW. Now if it were not for the reaction M of the groove, the fluxion of u would be $g\dot{t}$, instead of which it is $\dot{u}$; $\therefore$ I; $\dot{u} - g\dot{t} =$ (the action of the groove in the direction $CD = M\dot{t}$: again, the whole force on G parallel to AD is N; $\therefore$ II; $\dot{v} = N\dot{t}$. Again, the part of M which acts perpendicularly to GC to accelerate the velocity of C about G in the order CHL is $= M \times$ sine of $GCD = \frac{X-x}{a}M$; and the part of the force N which acts at C perpendicularly to CG to have the same effect is $= N$ cosine of $< GCD = \frac{Y-y}{a} . N$, and consequently the whole force to accelerate the velocity of C about G is a force at $C = \frac{X-x}{a} . M + \frac{Y-y}{a} . N$; but the velocity of $C \perp CG$ is $= \varrho$. sine of $GCD + \sigma$. cosine of $GCD = \varrho . \frac{X-x}{a} + \sigma . \frac{Y-y}{a}$; and the velocity of $G \perp CG = u . \frac{X-x}{a} + v . \frac{Y-y}{a}$; consequently the velocity of C about $G = \overline{\varrho - u} . \frac{X-x}{a} + \overline{\sigma - v} . \frac{Y-y}{a}$; and therefore putting $b =$ sum of $\frac{GP^2 . P}{CG^2}$, P being a particle of the

body, we have III; $\overline{\frac{X-x}{a}.M+\frac{Y-y}{a}.N}\times \dot t = b \times$ fluxion of $\left(\overline{\varrho-u}.\frac{X-x}{a}+\overline{\sigma-v}.\frac{Y-y}{a}\right)$. Moreover the absolute reaction of C is in the direction perpendicular to the groove; consequently, if FC is perpendicular to the groove we shall have IV; (the tangent of the $<$ FCD $=$) $-\frac{N}{M}$ (and likewise) $=-\frac{\dot Y}{\dot X}$; also V; $\dot t = \frac{\dot x}{v} = -\frac{\dot y}{u} = \frac{\dot X}{\sigma} = -\frac{\dot Y}{\varrho}$; $\therefore \varrho - u = \frac{\dot y-\dot Y}{\dot t}$; $\sigma - v = \frac{\dot X-\dot x}{\dot t}$; fluxion of $\left(\overline{\varrho-u}.\frac{X-x}{a}+\overline{\sigma-v}.\frac{Y-y}{a}\right)$ $=$ fluxion of $\left(\frac{\dot y-\dot Y}{\dot t}.\frac{X-x}{a}+\frac{\dot X-\dot x}{\dot t}.\frac{Y-y}{a}\right)=\frac{\ddot y-\ddot Y}{\dot t}.\frac{X-x}{a}+\frac{\ddot X-\ddot x}{\dot t}.\frac{Y-y}{a}=\left(\frac{\ddot Y-\ddot y}{\dot t}.\frac{\dot Y-\dot y}{a}+\frac{\ddot X-\ddot x}{\dot t}.\frac{\dot X-\dot x}{a}\right)\times\frac{Y-y}{\dot X-\dot x}$; because in consequence of the equation $\overline{X-x}|^2+\overline{Y-y}|^2=a^2$, it follows that $\dot X-\dot x.\overline{X-x}+\dot Y-\dot y.\overline{Y-y}=o$; consequently Equation III. becomes VI; $M\dot t.\overline{X-x}\,\frac{\dot X-\dot x}{Y-y}+N\dot t.\overline{\dot X-\dot x}$ or its equal $-M\dot t.(\dot Y-\dot y)+N\dot t.\overline{\dot X-\dot x}=\frac{b}{2}.$ fluxion of $\left(\left(\frac{\dot X-\dot x}{\dot t}\right)^2+\left(\frac{\dot Y-\dot y}{\dot t}\right)^2\right)$; but from equation IV; $-M\dot Y+N\dot X=o$ from equation I; $M\dot t=\dot u-g\dot t=-\frac{\ddot y}{\dot t}-g\dot t$; and from equation II; $N\dot t=\dot v=\frac{\ddot x}{\dot t}$; therefore equation VI. becomes $-\frac{\dot y\ddot y}{\dot t}-g\dot t.\dot y-\frac{\dot x\ddot x}{\dot t}=\frac{b}{2}.$ fluxion of $(\overline{\dot X-\dot x)^2+(\dot Y-\dot y)^2})\therefore$ VII; $\frac{\dot y^2}{\dot t^2}+\frac{\dot x^2}{\dot t^2}+2gy+f+b.\frac{\overline{\dot X-\dot x}|^2+\overline{\dot Y-\dot y}|^2}{\dot t^2}=o$, f being a constant quantity.

Moreover from equations I and II, we have $\frac{\dot{u}-g\dot{t}}{M}=\frac{\dot{v}}{N}$; therefore from equation IV, we have $\frac{\dot{u}-g\dot{t}}{\dot{v}}=\frac{\dot{X}}{\dot{Y}}$; therefore by equation V, $\frac{\ddot{y}+g\dot{t}^2}{\ddot{x}}=-\frac{\dot{X}}{\dot{Y}}$. We have now the means of examining whether the simple mechanism of the cheeks and silken thread is sufficient for the requisite of the body not moving about C (that is D of fig. 1.) as a centre, for were that the case, the angle which GC makes with the perpendicular, BC to the cheek would be constant. But the tangent of the angle FCD $=-\frac{\dot{Y}}{\dot{X}}$, and the tangent of the angle GCD $=\frac{X-x}{Y-y}$, or because $\overline{X-x}|^2+\overline{Y-y}|^2=a^2$, its equal $-\frac{\dot{Y}-\dot{y}}{\dot{X}-\dot{x}}$, and therefore the tangent of the difference of those angles the angle GCF $=\frac{-\frac{\dot{Y}-\dot{y}}{\dot{X}-\dot{x}}+\frac{\dot{Y}}{\dot{X}}}{1+\frac{\dot{Y}-\dot{y}}{\dot{X}-\dot{x}}\cdot\frac{\dot{Y}}{\dot{X}}}=\frac{\dot{X}\dot{y}-\dot{Y}\dot{x}}{\dot{X}^2-\dot{X}\dot{x}+\dot{Y}^2-\dot{Y}\dot{y}}=$ a given quantity; and consequently by help of this and the equations above, we are able to determine what curve the cheek ought to be in order for the body not to be moveable about the point C, and we therefore see, that when the cheek is chosen at pleasure, that in fact the simple mechanism of the cheek and thread is really not sufficient for the purpose. I shall, however, not at present further consider the general case of the $<$GCF being any given quantity, but proceed to the case of its being $= o$, that is when BCG is to be constantly a right line, as this seems to be the idea in the attempts to apply the cycloid for the purpose of tautochronism. In this case or last equation will evidently give $\frac{\dot{X}}{\dot{Y}}=\frac{\dot{x}}{\dot{y}}$, and therefore our equation $\frac{\ddot{y}+g\dot{t}^2}{\ddot{x}}=-\frac{\dot{X}}{\dot{Y}}$ gives $\dot{y}\ddot{y}+g\dot{t}^2\dot{y}+$

$\dot{x}\ddot{x} = o$, and therefore k being a constant quantity $\dot{y}^2 + \dot{x}^2 + 2g\dot{t}^2 y + k\dot{t}^2 = o$, and therefore by equation VII, $(f-k)\dot{t}^2 + b(\overline{\dot{X}-\dot{x}}|^2 + \overline{\dot{Y}-\dot{y}}|^2) = o$; therefore by means of one of these last equations exterminating $\dot{t}$ from the other, we have $\dot{y}^2 + \dot{x}^2 + \frac{2gy+k}{k-f} \cdot b\,(\overline{\dot{X}-\dot{x}}|^2 + \overline{\dot{Y}-\dot{y}}|^2) = o$, now suppose $\frac{\dot{X}}{\dot{Y}}$ which is to be equal to $\frac{\dot{x}}{\dot{y}}$ to be equal to R, and the last equation will become $\dot{y}^2\,\overline{1+R^2} + \frac{2gy+k}{k-f} \cdot b\,(R^2 \cdot \overline{\dot{Y}-\dot{y}}|^2 + \overline{\dot{Y}-\dot{y}}|^2) = o$ and therefore either $1 + R^2 = o$ which is impossible, or $\dot{y}^2 + \frac{2gy+k}{k-f} \cdot b \cdot \overline{\dot{Y}-\dot{y}}|^2 = o$; $\therefore\ \dot{Y}-\dot{y} = \sqrt{\frac{f-k}{b}} \cdot \frac{\dot{y}}{\sqrt{k+2gy}}$; $\therefore$ $Y = y + \frac{1}{g}\sqrt{\frac{f-k}{b}}\sqrt{k+2gy} + h$; h being a constant quantity; but because $\dot{x} = R\dot{y}$ and $\dot{X} = R\dot{Y}$, consequently $\frac{\dot{X}-\dot{x}}{\dot{Y}-\dot{y}} = R$ hence because as shewn above $\frac{\dot{X}-\dot{x}}{\dot{Y}-\dot{y}}$ is equal to $-\frac{Y-y}{X-x}$ we have R or its equal $\frac{\dot{x}}{\dot{y}} = -\left(\frac{1}{g}\sqrt{\frac{f-k}{b}}\sqrt{k+2gy} + h\right) \div \sqrt{a^2 - \left(\frac{1}{g}\sqrt{\frac{f-k}{b}}\sqrt{k+2gy} + h\right)^2}$ this is plain from the recollection of the equation $\overline{X-x}|^2 + \overline{Y-y}|^2 = a^2$; to proceed put $\frac{k}{2g} = r$, $\sqrt{2 \cdot \frac{f-k}{b} g} = n$ $\therefore\ \dot{x} = \dot{y} \times \frac{-n\sqrt{r+y} - h}{\sqrt{a^2 - (n\sqrt{r+y} + h)^2}}$ to find the fluent put $-n\sqrt{r+y} - h = w$; $\therefore n^2 r + n^2 y = \overline{w+h}|^2$; $\therefore\ \dot{y} = \frac{2}{n^2}\dot{w}\,\overline{w+h}$; consequently $\dot{x} = \frac{2}{n^2}\frac{w\dot{w} + h\dot{w}}{\sqrt{a^2 - w^2}}$; $\therefore x = -\frac{2}{n^2}\sqrt{a^2 - w^2} + \frac{2h}{n^2 a} \times$ (arc whose sine is w and radius a) $+ e$; e being some constant quantity; that is by restoration $x = -\frac{2}{n^2}\sqrt{a^2 - \left(\frac{1}{g}\sqrt{\frac{f-k}{b}}\sqrt{k+2gy} + h\right)^2} + \frac{2h}{n^2 a}$. arc whose sine

is $\frac{1}{g}\sqrt{\frac{f-k}{b}}\sqrt{k+2gy}+h$, to the radius a, $+e$; for the equation of the curve described by the centre of gravity of the body, when the thread produced in a right line constantly passes through the said centre of gravity: in the particular case of h equal to o, this gives a parabola; moreover, from the last equation and those above, it is evident, that the equation of the cheek having the proposed property may be found. We perceive in our last equation, four arbitrary constant quantities, these are determinable when we have the origin of the co-ordinates given, and the velocities and directions of C and G given at any proper period.

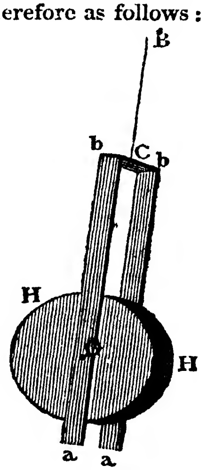
And here I observe, that if C and G are at rest at the same time, which appears to be the idea in the application of the cycloid cheeks, we shall have at that time $2gy+f=o$ and $2gy+k=o$; and therefore the constant quantities f and k equal to each other; but generally $(f-k)\cdot\dot{t}^2+b\cdot(\dot{X}-\dot{x})^2+(\dot{Y}-\dot{y})^2=o$ $\therefore$ $\dot{X}=\dot{x}$ and $\dot{Y}=\dot{y}$ generally if C and G are ever at rest at the same time; and taking the fluents $X=x+A$ and $Y=y+B$; A and B being constant quantities: but $\overline{X-x}|^2+\overline{Y-y}|^2=a^2$ $\therefore$ $A^2+B^2=a^2$; but as GC is by hypothesis to be perpendicular to the line described by G or C, it follows that the sine of the angle, that line makes with CD is $=\frac{B}{a}$, and is constant: and that line is therefore a right line, and this may be shown immediately from the equations above. It is to be observed, that the determination of $X=\dot{x}$ and $Y=\dot{y}$ from the equation $(f-k)\dot{t}^2+b\,(\overline{\dot{X}-\dot{x}}|^2+\overline{\dot{Y}-\dot{y}}|^2)=o$ when $f=k$; arises from the impossibility of its not being so. Hence it appears, that the requisite of the thread continuing to pass through the centre of gravity of the pendulum, is incompatible with the simple mechanism of any cheek and silken thread. I think this fact is not generally known. It likewise appears, that if a body be hung to a fixed point by a thread, one end of which is fastened to the said fixed point, and the other end to some point C of the body, which is not the centre of gravity thereof, such

thread during the vibrations of the body will not continually pass through its centre of gravity.

And from the first of these two last remarks, there is another immediately offered, namely, that in the vibrations of pendulums by means of the silken thread and cheeks, it may happen, and without having gone through the calculation, I venture to say most probably would oftener than not happen, that the thread does not quit one cheek to fold about the other, at the same time that the pendulum, or perhaps more properly speaking the point where the thread is fastened to the body, has performed half its vibration: this I think will produce an unexpected irregularity in the motion of the pendulum. Indeed I am told that there is a clock in the Observatory at Greenwich, whose pendulum was intended to vibrate between cycloid cheeks for the purpose of tautochronism, and that it has since been found that the flexible part of the pendulum (which I should add I am told is a spring) only winds about one of the cheeks.

Before I leave the cycloid cheek I shall offer a construction of a pendulum, which I think would correct in a great part its insufficiency when large, to produce tautochronism; we have already said the received theory is correct when the matter of the pendulum can be considered to be concentrated in one point, which, however, I have shewn cannot be properly so considered in the common constructions; and that it would be very incorrect when the matter of the pendulum is great, the construction is therefore as follows:

Fig. 4.



Let HGH fig. 4. be a heavy body, having an axis passing through its centre of gravity G; *ba, ba* two sufficiently strong slender bars fastened together at the top *b.b*, and sufficiently apart below to allow the heavy body HGH to be put in between them, whose axis is to be moveable in centres, in the bars *ba, ba*; this being done, let a thread BC have one end C fixed to the top *bb* of the bars, and the other end B fixed between the cycloid cheeks in the usual way; then it is plain, if the weight of the body HGH be great in comparison to the bars and thread by neglecting their effect as inconsiderable, we may consider the weight of the pendulum as all collected in G; provided there be little or no friction between the axis passing through G, and its centre, This point G, it is worth remarking, would be the centre of oscillation as well as the centre of gravity of the pendulum, whether the thread moves about a fixed point B, or winds about a cheek; which is not the case in the common construction. I may add, that in the common construction when the thread winds about a cheek, the place of the centre of oscillation in the weight is continually varying. Lest these remarks should appear to be in contradiction with our last solution, I observe that to bring that data to the case before us, we must take a equal to o, and then that solution would fail.

If we are not restricted to the case of $\frac{\dot{X}}{\dot{Y}} = \frac{\dot{x}}{\dot{y}}$ proceed thus,

Equation V. may be written $\dfrac{\text{fluxion of } \frac{\dot{y}}{\dot{t}} + gt}{\text{fluxion of } \frac{\dot{x}}{\dot{t}}} = -\dfrac{\dot{X}}{\dot{Y}}$ in

which we may choose the fluxion which is to flow uniformly, as is evident from equations I, II, IV, V; ∴ from equation VII. exterminating $\dot{t}$, we shall have a fluxional equation, between x, y X and Y, then by help of the equation $\overline{X - x}|^2 + \overline{Y - y}|^2 = a^2$, and some other equation, such as the relation between X and Y, if the equation of the cheek should be given, or if it

were required that the body had no motion about C as above hinted instead of having the cheek given, using the equation $\frac{X\dot{y}-Y\dot{x}}{\dot{X}^2-\dot{X}\dot{x}+\dot{Y}^2-\dot{Y}\dot{y}}$ = a given magnitude, exterminating two of the unknown quantities, we shall have the equation of the curve described by the centre of gravity of the body, &c.

Moreover the action of the body on the groove is in the direction FC and $= -\frac{N}{\text{cos. of CFD}} = -\frac{\dot{v}}{\dot{t}\,\text{cos. of CFD}}$; consequently if this be affirmative, and instead of C being acted on by the groove, it be acted on merely by the silken thread BC winding about the cheek at B, the thread would become slack and cease to act.

Art. III. Medical Jurisprudence. *Foderé Médicine légale*, 8vo. 6 *vols. Paris*, 1813. *Orfila Toxocologie générale considérée, sous les Rapports de la Physiologie, de la Pathologie, et de la Médicine légale, Paris*, 1815.

Our attention has been directed to the science of Medical Jurisprudence or *State Medicine*, as it is termed in Germany, by some recent publications of considerable merit. As a science it is not known in this country, nor does it form any part of the necessary studies of the medical practitioner. In the present Paper, we shall point out what we consider to be its leading branches; and we are so convinced of the benefit which would result to mankind from a more general attention to this science, that we shall not apologize for having entered on a subject which may probably be considered not to be immediately within the limits of our journal. The science of Medical Jurisprudence comprehends the evidence and opinions necessary to be given in courts of justice, by practitioners, on all subjects relating to their profession: according to the English laws, the testimony or the opinions of medical

men are not directly required, though it is usual in certain cases, to require their evidence on professional subjects: public attention has been of late called to the laws now in force relating to coroner's inquests, and the mode in which they are administered. This subject is intimately connected with Medical Jurisprudence. Without wishing to discuss the propriety of the laws for the punishment of suicide, so far as they relate to the forfeiture of property, and the giving publicity to the offence; there can be little question but that the exposure of the body of the suicide is not consonant to the feelings of the present age; and yet it cannot be forgotten, that within a short period the body of an unfortunate wretch was, in open day, dragged in procession along the public way, headed by the civil power. Very slight evidence, or rather no evidence at all, but merely the discretion of the coroner, is sufficient to procure a verdict of lunacy; and that such verdicts are often corruptly procured, no person who has attended to the proceedings of coroners' inquests, can have any doubt. It may be questioned whether an ignominious burial has any direct tendency to the prevention of suicide; and unless it is clearly established that it has, in an enlightened age like the present so barbarous and disgusting a law should be abolished, or at least why should not the very fact of suicide be considered in *all* cases, as affording evidence of insanity? It is of the utmost importance to the due administration of justice that the evidence before the coroner should be complete and correct. To insure this, it will be requisite that enactments should be made, at once regulating the mode of producing such evidence, and the class of persons by whom it is to be given. Several instances of the grossest neglect and irregularity in the evidence of medical persons have come to our knowledge; the following is one of the most flagrant:—a servant had died in consequence of poison; it was supposed she had taken it purposely, though she stated that it was taken by her as a dose of salts which had been carelessly left about by another servant: there was, however reason to suspect that she had been pregnant, and had lately miscarried. The prejudice was consi-

derably excited in favour of the deceased having taken the poison accidentally. Two medical gentlemen of eminence attended to examine the body; the apothecary who was to give evidence before the coroner, was also in attendance; and as, from the early part of the examination, there was little question but that the woman had been pregnant, on the examination proceeding, the apothecary actually left the room, stating, that as he was to be examined before the coroner, if he gave any evidence which might seem prejudicial to the character of the deceased, it would seriously affect his professional interests in the neighbourhood! Now, in this case, independently of false evidence having been in fact given before the coroner, injustice was done to the servant who was supposed to have brought the poison into the house. In order to insure proper attention and skill on the part of medical persons who may be called in to give their evidence before coroners, we should propose that in addition to the usual course of education, all medical students should be required to attend a certain number of lectures exclusively on the subject of Medical Jurisprudence, in which their attention would be particularly called to those parts of the science of medicine, respecting which they would be liable to be called upon to give their opinions, in courts of justice, with peculiar directions as to the nature of the proof required, and the effect of their testimony. In addition to this, we conceive much benefit would arise from the prescribing particular rules to be adopted in all cases of sudden or suspicious death; and making it imperative on the coroner to employ particular medical persons (who should be remunerated); and for this purpose a certain number of practitioners in each county, who had previously passed such examination as might be thought fit, should be named as the persons to be employed by the coroner; and that every such examination should be made according to certain directions to be determined on, and a report of it in writing signed and sworn to by the person making it. In order to facilitate the mode of making these examinations and reports, certain printed formulæ might be devised, stating the mode of examination to be pursued, and the results; such formulæ, of

course to be varied according to circumstances. This is the mode adopted in France, and in other countries in Europe, and from the adoption of which we conceive much benefit would arise. The reporter might still be examined *vivâ voce*, either before the coroner, or on the trial. Independent of the improvement which would result from this, in the administration of justice, much good would arise from the removal of doubt and suspicion in the public, which is often misled by the evidence given before coroners, on medical subjects, owing to the unfitness of the persons employed. There can be little question, that had the examinations and analysis been skilfully made, no public disturbance or discontent would have arisen in the case of Elizabeth Fenning, who was executed for an attempt to poison the family of a stationer, in Chancery-lane.

The evidence of medical men, amongst lawyers, is a subject of general animadversion; and indeed it is impossible to refer to the several printed trials, such as those of Spencer Cowper Donellan, and others, without astonishment at the inconsistency and uncertainty which seems to have pervaded the opinions of former medical practitioners.

It may also be expected, that much good will result from the canvassing the points necessary to be attended to, in examinations of the nature we have mentioned, and that greater skill will be attained, and important discoveries made, in the application of remedies in cases of suspended animation, the administration of poison, &c. respecting which, little attention seems to have been paid by the generality of the present practitioners, at least those of the second class; and it is amongst the second class that skill and knowledge in this branch of science is particularly required, as they are most frequently called upon in cases of poison, &c.

The first directions respecting the consulting medical men, in the administration of justice, in any modern code, is in the Constitutio Criminalis Carolina, of Charles V. which enacts, that the evidence of medical men shall be taken in cases of violent death, poison, child murder, &c.; and now by the laws of most of the States in the Continent of Europe, their evidence is required in similar cases. The code Napoleon,

one of the most singular productions of modern Jurisprudence, gives, at considerable length, the rules to be observed in making the necessary reports, and in the testimony on medical subjects connected with Jurisprudence.

The most distinguished works on this science, amongst the Germans, are, the Pandectæ Medico-legales, of Valentini, 1702; the works of Plenk, Frank, and Sikora, together with the Colatio Opusculorum Selectorum ad Medicinam Forensem spectantium: curante Schlegel, 1787.

Amongst the Italians, Paul Zacchias is most distinguished. Ambrose Paré was the first in France who treated on this subject; and the Médicine légale et Police médicale, of M. Mahon; "the Course of Legal Medicine," of M. Belloc; the Médicine légale of M. Foderé, and the Toxicology of M. Orfila, are amongst the most eminent of the modern French works on the subject. In this country, with the exception of the Lectures of Dr. Duncan, of Edinburgh (where there is a professorship, for the study of Medical Jurisprudence) we have no publication of any note, although there are several Essays, on particular subjects relating to Medical Jurisprudence, of considerable value. Amongst the foremost, is to be reckoned the Paper of Dr. W. Hunter, on the uncertainty of the signs of murder in bastard children.

We shall conclude our remarks on this subject, with a concise enumeration of the subjects embraced by the science of Medical Jurisprudence, which we shall notice in the order in which they are treated of in the work of M. Foderé, which, though very prolix, and written without either great professional skill or talent, contains much curious information on the science, as well as the opinions of most of the preceding writers on the subjects discussed.

The *physical qualities* of man, form one of the first and most important subjects of enquiry. According to the laws of all civilized nations, there are certain fixed epochs when reason is to be considered as sufficiently developed for the exercise of certain acts; such as the dominion over property—union of sexes—holding of offices, &c.—Majority is to be considered a civil institution, varying in different nations

and climates. In the debates on the code Napoleon, no point was more discussed, than, whether the period of majority should be fixed at 21 or 25; but the former was determined on, except in the case of power to contract marriage, and the discharge of some particular functions. Many cases may arise, and have arisen in this country, in which the age of a party is only to be ascertained by presumption, and it is obvious, that the opinion of medical men on this subject, must have considerable weight. A considerable portion of the first volume of M. Foderé's work, is taken up in discussing the physical powers of man, at different ages, as far as regards his legal capacities—the commission of crime, and infliction of injury. The Médicine légale of M. Foderé contains a very detailed commentary on the code Napoleon, which, like many other codes, attempts to establish a scale of the physical powers of man, by which their faculties and incapacities are to be ascertained. Zacchias, one of the most sensible writers who have considered this subject, which, it seems, has (fruitlessly enough, in our opinion,) occupied the attention of many jurists and medical writers, admits, that the legal period of age, must arise from arbitrary presumption, rather than from any rules resulting from observation of nature, whose variations are infinite.

Many important points arise on the question when the period of gestation ceases: from 45 to 50 is the ordinary time, though there are exceptions. This point was much canvassed in the Douglas cause. Haller, speaking upon this subject, mentions many women who have borne long after 50, and who, it may be said, experienced a sort of second youth — have borne, as he states, up to 70. The English law admits of no presumption, as to the time when a woman ceases to have children, though this enters into most other codes. In England, property, which reverts to the parents, in default of issue, is frequently tied up till after their death, though the moral probability of their having issue may long have ceased.—Many curious points seem to have arisen in France and other countries, with respect to identity; and the subject, in all the treatises, is noticed at considerable length.

The next point is, the relative and absolute duration of life. In case of absence, the English law admits of great latitude; and as each particular instance is determined by a jury there is very little certainty as yet established; great practical convenience, however, would result from fixed rules on this subject.—The relative mortality of the sexes is also considered, at length, by M. Foderé.

The presumption of survivorship, amongst persons perishing by the same mischance, as shipwreck, suffocation, &c. When no positive evidence can be procured, as to the exact periods of their death, is also another point of which the foreign jurists have written much, but respecting which, we have no positive rules in this country. It frequently becomes a question of considerable importance, in the devolution of property, to ascertain which of two persons survived; as parent or child, testator or legatee, &c. The laws of several nations, have admitted of arguments, drawn from the relative supposed physical powers of the parties to sustain life, such as are to be inferred from the difference of age, sex, &c.

In imitation of the civil law-codes, the code Napoleon has attempted to lay down particular rules for the devolution of property, in cases of this nature; we extract the following passages:—" persons dying, who are the legal representatives to each other, without it being known which died first, the presumption of survivorship is to be determined by the circumstances of the case, and in default thereof, by the strength, age, and sex of the parties. If those who shall so die together, shall be both under 16, then the *eldest* shall be presumed to have survived; if they were all above 60, then the *youngest* shall be presumed to have survived; if some under 15, and others above 60, then the first shall be presumed to have survived; if all are above 15, and under 60, then the male is presumed to have survived, if the ages are equal, or the difference does not exceed a year; if they were of the same sex, then the presumption of survivorship, according to the order of nature, is to be adopted, and the younger is supposed to have survived the elder." In this there is an odd mixture of arbitrary rules, and an attempt at reaching the

probable truth, by a comparative estimate of the physical powers of man; besides, many objections might be made to the above rules, as far as they attempt to regulate *on principle*, the doctrine of presumptions, we conceive, that the simplest law, and the one that would most probably come nearest to natural justice, would be to enact, that in all cases, the order of nature should be presumed to have taken place, and therefore, if father and child died, whatever their probable physical powers, the child should, as in the course of nature, be considered as having survived the father; and so in all cases of succession. The English law, on this subject, is entirely defective, and although there have been questions in which it was necessary to decide which was the survivor, in the absence of all but presumptive evidence, it does not appear that any decision was ever made, or that any principle of law was admitted, either original, or as adopted from the civil code; whereas, if some fixed rule were adopted, parties at least would not be ignorant of the nature of their rights. In a cause lately before the Court of Chancery, which was the case of a legatee and testator being shipwrecked in the same ship, it was sent by the Master of the Rolls, to be tried by a jury *which survived*, though he admitted there was a *total absence of all evidence*, on which they could found their verdict; whereas, had some principle, with regard to legatees and testator dying, been adopted, no question could have arisen. Notwithstanding the manifest fallacy of all reasoning tending to prove who was the survivor from the relative physical faculties of the deceased, it seems to have been a frequent subject of speculation amongst the writers on Medical Jurisprudence; and a very considerable part of the second volume of Foderé's work, is devoted to the consideration of the modes of ascertaining the probable survivor, in cases of death, by shipwreck, fire, cold, suffocation, &c.

The consideration and study of the different defects of the mind, form an important branch of the study of Medical Jurisprudence. Pinel has divided the diseases of the mind into four classes;—*mània*, or general delirium; *melancholia*, or exclusive delirium; *dementia*, or obliteration of

thought, and *idiotism*, or abolition of the intellectual faculties. But the diseases of the mind are so varied, that it is difficult, with certainty, to class symptoms admitting of such infinite variety; however, questions at once involving life and property, are frequently dependent on the judgment and the evidence of the practitioner. From insanity are to be distinguished hysterical affections, the effects of depraved instincts, jealousy and inebriety, excesses arising from sudden accessions of peculiar passions of the mind, and temporary alienations of reason arising from disease. In considering the faculties of man, many curious questions arise on the moral and physical powers of those who are born deaf and dumb, as to their capacity of performing the different functions of life, and how far they are amenable to punishment for the commission of crimes. In this country, these are questions on which a jury alone decide. Another question, in which the testimony of medical men is of considerable importance, is the consideration how far persons affected by disease, executing a will, are to be considered in a situation to judge of the propriety of the act executed by them.

Of Marriage.—Few, if any, questions are now likely to arise in England, relating to the *time* and *capacity* of parties to marry. The subject of marriage involves that of *impotence*, which may be divided into absolute and perpetual, relative and accidental, or temporary, curable and incurable.

Pregnancy.—No one part of legal medicine involves so many important questions, as *conception* and *childbirth*; and none are more entangled with difficulties. These points, from their importance, call for the greatest care and circumspection. The signs of conception are divided into rational, particular, and sensible; and notwithstanding the advancement of science, the knowledge both of the one, and the other of these signs, is sometimes involved in great difficulty, and frequent errors occur, in the judgment of the most experienced practitioners, even when women have no motive for concealment. The question of superfœtation, has given rise to much learned discussion: M. Foderé sides with Buffon, Haller, and the other advocates for it—and thinks it is of

rare occurrence, but not impossible. A case of a woman who had twins, one white and the other black, is mentioned by Buffon.

The symptoms of delivery, and how far they are to be distinguished from all other uterine excretions, form another important topic; as also the period of time after delivery, the symptoms may be ascertained with certainty.—The capacity of women in labour to render proper assistance to the fœtus, so as to preserve life.—The determining whether the fœtus died before, or after delivery—upon this point much difference of opinion exists, and it is deserving of considerable attention, in order to enable the practitioner to do justice in giving his opinion.

Utero-gestation.—The next object of discussion, is the period of utero-gestation. In all other animals, the period of utero-gestation is very constant. Haller states, that the time of going with young is very regular in animals, but that it is not so regular in women. He gives references by which we read of a woman going ten, eleven, twelve, thirteen, and even fourteen months. Hippocrates says, that, "he can allow the possibility of a child being born at ten months, but not later." The former system of France allowed ten months. By the code Napoleon, the legitimacy of a child born 300 days after the dissolution of the marriage, may be questioned.

Dr. Clarke, in his Lectures, published under the title of London Practice of Midwifery, treats the possibility of the periods extending beyond the forty weeks with ridicule, though contrary to the opinion of many very distinguished practitioners, and indeed, as some have conceived, contrary to reason; for as the fœtus receives its nourishment from the mother, the probability is, that any very material alteration in her constitution, may cause the retardation, of the maturity of the infant. Besides, the fact of irregularity, in the time of utero-gestation, has been satisfactorily established, in the case of animals, when no motive for prejudice or concealment can arise. With regard to the legitimacy of children born in wedlock, only two reasons are allowed against

the legitimacy of the child by the code Napoleon; viz. absence of the husband, or his being affected by some disease, by which it is to be inferred, it is impossible he should be the father of the child. Non access is the only ground of disputing the legitimacy in England; but the rule of evidence in this respect, has been of late very materially altered, by the opinions of the judges in the Banbury peerage, who have, it is conceived, introduced an *anomalous* division respecting the evidence of access, dividing it into *access*, and *generative access*; so that if this distinction be hereafter recognised, much uncertainty may be introduced respecting the title and succession to property, and a new and difficult subject will demand the attention of the medical student.

In discussing the time when the fœtus may be supposed to be perfect, the faculty of Leipsic, with great complaisance, determined that a child, born five months and eight days after the return of the husband, might be considered as legitimate, and that children at five months, were often perfect and healthy. *Valentini*, who reports this decision, is also gallant enough to concur in it.

By the English laws, an husband is entitled to a life interest in the estate of his wife, if he have a child born alive; and the expression of the old law is, if the child should be heard to cry. Some cases, where children have been born alive, but have not uttered any cry, though they have breathed for a continued period, have caused much learned discussion; and a case in 1806, in the Exchequer, (where the lips of an infant had moved after birth, but no cry was heard,) gave rise to much curious evidence, particularly by Dr. Denman, who was of opinion, that the motion of the lips immediately after birth, was not a decisive proof of the presence of the vital principle, and distinguished between *uterine* and *exterior* life, the latter being called into action by the operation of the air on the lungs. Each case of this nature in England, is determined by a jury, on its particular circumstances: according to the civil code, *idem est non nasci, et non posse vivere.*

Till the relaxation of the severity of the laws in this

country relating to infanticide, many unfortunate mothers suffered death for crimes they never committed. Prejudice on the part of the juries, and ignorance on that of the practitioners, seem to have conspired to destroy the wretched mother. Dr. William Hunter, in his able paper on Infanticide, was one of the first who had the credit of turning the public attention to this subject. No one has written more eloquently in favour of the female character; and from the opportunities of observation, which his extensive practice afforded him, there is no one whose opinion is entitled to higher respect. Even now, however, it may be doubted, whether there are not some who suffer unjustly, when the incapacity of the mother to assist her infant in a concealed delivery, the probable accidents arising from position, fainting, and delirium, are considered: the horror excited by the idea of a mother's murdering her offspring, may still prevent mankind from judging of the case of the infanticide with impartiality; added to this, the natural appearances have not unfrequently been attributed to violence; and a case has been noticed as having occurred a few years ago, where the sutures and fontenelle were mistaken by an ignorant practitioner, for fractures of the skull. That to form an opinion, which is to decide the fate of a fellow being, on a subject so difficult, and presenting so extensive a field for observation, requires the narrowest scrutiny and attention, need not be noticed; and the probable improvements in our skill respecting these matters, may be easily imagined, when it is considered, how short time since, the lungs, swimming in water, was considered as decisive evidence, that the fœtus had inspired air, and which is now admitted to afford, at best, but a very uncertain criterion of the existence of extra-uterine vitality.

The cases of monstrous-births have seldom given rise to legal discussion in this country, though the works of foreign writers abound with descriptions of them.

The next class of cases which occur, are, the appearances of death in bodies, and whether the death was natural or violent, as in the case of strangulation, suffocation, drowning, &c. from blows and wounds, &c. and the determining

whether particular wounds are to be considered as mortal; after these, come rape, and feigned diseases, the most frequent of which are, epilepsy, insanity, ulcers, and blindness, &c.

Poisons.—We now come to that part which relates to poisons, which have been treated of by M. Orfila, in the work before noticed, and which is one of the most material and extensive subjects of Medical Jurisprudence. The first part of this work contains the particular history of the different poisonous substances considered under their relations with chemistry, physiology, pathology, and Medical Jurisprudence. The history of each poison, is comprised in different paragraphs: comprehending the explanation of its chemical properties, and external characters; its physiological action, determining the effects of poisonous substances, when administered in doses capable of producing accident, with the results of experiments; the general symptoms; the lesion of texture produced, comprehending the nature of the alterations produced by the poison, the application of the facts in the preceding parts to Medical Jurisprudence; with the different courses to be pursued by the practitioner in cases of poison; lastly, the treatment of poisoning, and the consideration as to whether any thing exists in each case possessing the properties of an antidote.

The second part comprehends all that relates to poisoning generally considered, with the symptoms which distinguish acute poisoning, from diseases, such as cholera morbus, &c. explaining the variations of symptoms, the mode of ascertaining the nature of the poison, the history of slow poisons, with the diagnosis, the examinations of dead bodies of persons poisoned, and the researches proper for establishing a distinction between sudden deaths produced by a natural cause, and those which are the result of the agency of poisons, and a comparison of the lesions of texture exhibited by the dead bodies, under these two circumstances, which are altogether different; and the work concludes with directions for the preparation of tests noticed in the preceding parts. To compose a work containing such extensive and important subjects, it was necessary to institute a numerous series of experiments and

researches, many extremely difficult; and we think this has been done with considerable success by the author. The physical characters and chemical properties of each poison, with the appearance it presents when exposed to the action of the different tests; and the difference which the poison, when mixed with different alimentary substances, presents with the same tests, are distinctly shewn; together with the modification produced by the admixture of the saliva, gastric juice, &c.

M. Orfila treats of the different poisons according to the classification of M. Foderé, as the most rational and conformable to the ideas of physiology.

Class 1. *Corrosive Poisons.*—So called because they irritate and corrode the texture of the parts with which they come in contact. Their action is in general more formidable than other poisons. All the acids, alkalies, and most of the metallic preparations come under this class. There are 15 species, noticed by M. Orfila, viz. preparations of mercury, arsenic, antimony, copper, tin, zinc, silver, gold, bismuth, the concentrated acids, caustic alkalies, the caustic alkaline earths, muriate andc arbonate of barytes, glass, and enamel in powder and cantharides.

Whenever the smallest quantity of any of these bodies is administered internally, various changes occur either momentary or durable; exciting the brain or heart; or acting as sedatives; increasing or diminishing the customary secretions. Given in larger doses, the poison is absorbed, carrying in some instances its fatal action to the brain and other organs. In certain cases it corrodes the membranes of the stomach, which acts by sympathy on other organs, without absorption taking place. The general symptoms produced by these corrosive substances depend upon the lesions of the alimentary and nervous system, and of the organs of circulation. The corrosive poisons frequently leave behind traces of their passage over our organs. Inflammation of the first passages, contractions of the intestinal canal, gangrene, sphacelus, and perforation of the parts constitute the first character of these lesions, and the mucous coat easily detaches itself from the muscular, and the action is frequently extended to the other viscera, although these cha-

racters are sometimes wanting, and the dead body exhibits no alterations. Various modes have been adopted at different times to counteract the effect of poison, and many serious errors have arisen from practitioners mistaking the results of chemical operations : and the substances administered for the purpose of decomposing the poisons, have exerted no action whatever upon them in the stomach ; and even when the decomposition has been effected, the new compound has been endued with active poisonous qualities. " The evacuant, antiphlogistic, and antispasmodic method, appears to us," observes M. Orfila, " to merit the preference, for, without exposing the patient to the danger which a chemical decomposition might subject him, it offers the double advantage of getting rid of the poison by simple means, and re-establishing the faculties at the same time."

In this class of poisons, cases arising from the ingestion of corrosive sublimate, verdigris, arsenious acid, nitric, and sulphuric acid, are most frequent. In France, where the sale of poison is restrained by law,* the most common poisons taken for the purpose of committing suicide, are, the nitric acid of commerce, and a mixture of concentrated sulphuric acid and indigo, used in dyeing. Of all the mineral poisons, the effects of the nitric acid seems most terrific ; it acts with great rapidity on the animal economy, producing symptoms almost constantly succeeded by death. In cases of poisoning by these two acids, in addition to mucilaginous drinks and vomits as remedies, Mr. Orfila suggests the administering magnesia suspended in mucilage. Frequent mischief has lately occurred in this country, from the accidental ingestion of the oxalic acid. This is sold indiscriminately by druggists, under the name of *acid of sugar*, for various domestic purposes, many of whom were, till lately, ignorant of

* The frequent occurrences noticed in the papers, of fatal mistakes, from neglect and ignorance of the apprentices of the retailers of drugs, point out the necessity of some legislative directions, as to the sale of dangerous substances, accompanied by severe penalties, in cases of neglect or ignorance.

its deleterious effect. Nine cases of accidental death are noticed by the editors of the Medical Repository, as having occurred within two years and a half; and the Number for the last December, contains a Report of the case of a death by oxalic acid; a woman having taken nearly an ounce by mistake for Epsom salts. In a short time after taking it, she complained of pain, vomited up a small quantity of fluid, threw herself on the bed, and expired within a quarter of an hour after swallowing the acid. The body, on dissection three days after death, presented appearances similar to those in other cases by death from concentrated acids: the cuticular coat of the œsophagus peeled off with the slightest touch; the blood vessels of the inner coat of the stomach, appeared as if injected with a carbonaceous substance, and the stomach itself was in some parts so completely perforated, that its contents had escaped into the cavity of the abdomen. The conclusion drawn by Mr. A. T. Thomson, from experiments instituted by him, on the nature of this acid, was, that a mixture of chalk and water, by producing oxalate of lime in the stomach, may be regarded as an antidote, if exhibited very soon after the poison has been taken.

In cases of poisoning by corrosive sublimate, in addition to the general remedies for this class, the administration of albumen is recommended by M. Orfila.

The daily use of utensils of copper, and the facility with which copper combines with oxygen, renders accidental poisoning by preparations of it very common. The seat of the lesions of texture, produced by verdigris, is principally in the digestive canal, and when death takes place a few hours after taking the poison, the mucous lining of the stomach is found to be inflamed, and gangrenous: sometimes the inflammation is communicated to all the coats of these viscera, and sloughs are formed, which are quickly detached, and leave openings through which their contents pass out, and are effused into the cavity of the abdomen. Amongst mineral poisons, there are few which exert so powerful an action as the muriate of barytes, as appears from Mr. Brodie's experiments: no case, however, is detailed, of poisoning on the

human frame by the compounds of barytes. Much difference of opinion exists, whether the sharp fragments of glass, &c. which by some are classed as poisons, may be swallowed with impunity. In cases of poison by cantharides, the lesions of texture of the digestive canal are similar to those of other corrosive poisons, occasionally, however, accompanied by inflammation of the bladder. To the corrosive poisons may be added, Iodine, which, from the experiments of M. Orfila, appears, when introduced into the stomach to the amount of a drachm, in dogs, to produce death. Six grains were taken by M. Orfila, which produced violent evacuations, and a pulse of 125: he recovered the effects by the next day.

Class 2. *Astringent Poisons,*—are so called, because they frequently produce a remarkable constriction of the great intestines, and especially of the colon, and in the end, produce inflammation of the texture of the digestive canal, and frequently exert their action on the nervous system. No medical subject has excited more interest, or given rise to a greater number of monographs, by eminent writers, than the treatment of diseases resulting from the astringent or lead poisons, and for this reason, the mode of cure is best understood, and oftenest followed by success.

The varieties of this poison are, acetate of lead, red oxyde, or litharge, carbonate of lead or cerussa, wine sweetened, and water impregnated by lead. All artificers, who use, or are exposed to the action of lead, or its compounds, are often attacked with the most severe cholics, sometimes succeeded by death, from having only handled saturnine preparations, or even from having been placed within the sphere of their emanations. In these cases, the digestive canal exhibits no vestige of inflammation: a contraction of the diameter of the great intestines, particularly of the colon, accompanied by severe gripings, is the chief symptom, but no fever takes place, whatever the intensity of the pain. Acetate of lead introduced into the stomach, in small quantities, produces inflammation of different parts of it; and the salts of lead, when injected into the veins, destroy life.

As the sulphates of soda, magnesia, &c. decompose the

salts of lead with facility, and a large quantity may be given with impunity, and the metallic sulphate resulting from this decomposition, is insoluble: the sulphate of soda, &c. are therefore recommended by M. Orfila, as the best antidote to the corrosive effects arising from saturnine poisons. The mode of treating the cholic arising from saturnine emanations, is, of course, altogether different.*

Class 3. The name of *acrid* poisons is given to those with a caustic taste, and which applied to the surface, produce inflammation, usually terminated by suppuration; and which, introduced into the stomach, produce local phenomena, analogous to the corrosive poisons, though some authors have attempted to establish distinctions in the appearance of the lesions of texture on dissection. The action of vegetable and animal poisons on the human frame, being more complex, are more difficult to understand than those of the mineral poisons. The class of acrid poisons is divided into two sections, with reference to their action on the animal economy: the first, highly irritating the membranes, and producing violent inflammation, and a sympathetic action on the brain, which is the principal cause of death; and it does not appear that they become absorbed into the system, or at least, they are so with difficulty. Amongst the chief of these are, the briony root, momordica claterium, many species of euphorbium,† nitrate of

* For some valuable observations on this subject, see Dr. Pemberton's Treatise on the Diseases of the Abdomical Viscera.

† A case of death by euphorbium, used by farriers for blisters, has been kindly communicated to us by Mr. Furnival, of Egham. A tea-spoonful was administered by a farrier, in the dark, by mistake for rhubarb. Mr. F. saw the patient about six hours after the ingestion of the poison. He described the sensation on swallowing the poison, to be that of burning heat in the throat and fauces, afterwards communicated to the stomach; incessant vomiting of watery fluid took place almost immediately; the tongue was covered with thick mucus; the pulse very irregular, and at least 150; the patient was in a cold perspiration, and unable to speak intelligibly. An emetic of sulphate of zinc and ipecacuanha was given, and its effects quickened by introducing the probang into the œsophagus, a small quantity of thin black fluid only was

potass, and chlorine: the activity of these poisons, is generally greater when introduced into the stomach, than when applied to wounds. Our limits do not admit of entering into details as to the particular action of each: we shall, however, give the conclusions of M. Orfila, from his experiments with the nitrate of potass. 1. It causes death when vomiting has not taken place, and when taken in doses of two or three drachms. 2. It appears to act immediately on the mucous membrane of the digestive canal, and consequently on the nervous system in the same way as stupifying substances do. 3. It is not absorbed when applied to the cellular membrane, and consequently its effects are, in such cases, only local.—The second section of this class comprehends poisons, which, by being absorbed, are taken up by the circulation, and act directly on the brain, at one time stupifying, and at others stimulating to an excess, producing more or less inflammation. Amongst these are the black and white hellebore, aconite, squills, toxicodendron, &c. of which the hellebore offers the most curious effects, causing violent vomitings in a few minutes after its application to a wound, and stupor almost immediately takes place, and death supervenes quicker, even than if the poison had been introduced into the stomach. The white is more active than the black hellebore, and its deleterious parts are those which are soluble in water, consequently more dangerous.

The general mode of treatment in cases of poison by this class, appears to be the antiphlogistic system, rejecting in all cases, acids which have sometimes been proposed, as they constantly increase the irritation.

Class 4. *The Narcotic Poisons,*—including opium, hyoscyamus, prussic acid, and the vegetable substances containing it. Opium,

discharged; both mucilages and anodynes were given, but almost instantly rejected: he lived nearly three days, and on opening the body, eight hours after death, there were found in the stomach, several spots of mortification, the coats of the stomach ruptured on the slightest touch, the spleen very much enlarged, and tore on the smallest force being applied to it; the vessels of the internal coat of the aorta were most beautifully injected with blood, and shewed marks of the highest degree of inflammation and vascularity.

according to our author, cannot be considered either as coming directly within the class of narcotics, or stimulating poisons, its action being *sui generis*. Animals on having it administered, become first stupified, then exhibit symptoms of considerable excitement, during which they suffer great pain, and violent convulsions supervene, differing considerably from the effects arising from hellebore. The observations on the prussic acid, are interesting. We give shortly the results of M. Orfila's mode of treating this class of poisons. 1. Vegetable acids constantly accelerate death when mixed in the stomach with the poison, as they facilitate the solution of the poison, and consequently its absorption. 2. Acidulated water is useful, when the poison has been rejected. 3. Strong infusion of coffee successfully resisted the effects of narcotic poisons, when administered unremittingly. 4. The decoction of coffee, always less energetic than the infusion. 5. Camphire cannot be considered as an antidote, though beneficial when administered in small doses. 6. Mucilaginous drinks promote the absorption. 7. Bleeding sometimes beneficial.

Class 5. *Narcotic-acrid poisons.*—This class comprehends the upas, nux vomica, some fungi, alcohol, æther, belladonna, stramonium, tobacco, hemlock, &c. The results of M. Orfila's experiments correspond with those of former writers on those poisons, amongst the most distinguished of whom is Mr. Brodie.

The last class is composed of the *septic poisons*, which produce general weakness, and syncope, without in general altering the intellectual faculties. In this class is sulphuretted hydrogene gas, and the venemous animals whose bite or sting is accompanied by pain or death. Our limits preclude us from noticing the mode of treatment of cases arising from poisoning by these two classes.

The detailed account of the poisons is followed by general observations of the utmost consequence to the science of Medical Jurisprudence: they chiefly consist in the description of spontaneous diseases, which are frequently confounded with cases of poison, as cholera morbus, indigestion, malig-

nant fever &c. and the affinities of the appearances of these are carefully examined and distinguished from the operations of poison.

That the subject of medical Jurisprudence is of the most serious importance, we think it is unnecessary to repeat. We have merely, in an hasty sketch, glanced at the points most likely to occur in the practice of medical men; and although of late, some attention seems to have been paid to the subject, still it is obvious that much remains to be done.

ART. IV. *A Descriptive Account of Mr. Thompson's Laboratory at Cheltenham, for the Preparation of the Cheltenham Salts; with a Chemical Analysis of the Waters whence they are produced. By* W. T. BRANDE, *Esq. Sec. R. S. F. R. S. E. M. Geol. Soc. Prof. Chem. R. I. &c.; and* SAMUEL PARKES, *Esq. M. R. I. F. L. S. M. Geol. Soc. &c.*

THE town of Cheltenham, in the County of Gloucester, is situated 95 miles north-west of London, on the borders of a fertile vale, and nearly surrounded by hills of magnesian limestone. A stiff blue clay, containing abundance of iron pyrites, with a great variety of marine animal remains, for the most part covers the limestone; and this bed of clay, intersected occasionally by veins of sand, runs out from the hills to a considerable distance under the soil of the valley. Thus situated, the vale has the appearance of a large amphitheatre; and considering the materials of which the several strata are formed, together with those of the surrounding hills, a geologist would expect to find abundance of *mineral waters* throughout the district. Therefore, notwithstanding their variety, their production may be satisfactorily accounted for on natural principles. For, although carbonate of soda, sulphate of soda, and muriate of soda, together with carbonate of iron,

muriate of magnesia, and sulphate of magnesia, may all be procured from these waters, there is no difficulty in accounting for the origin of each of these salts. The decomposition of the martial pyrites would furnish the carbonate of iron, which renders these waters so highly chalybeate; likewise the acid for the production of all the sulphuric salts, as well as the sulphur for the formation of the sulphuretted hydrogen found in these waters. The muriate of soda or common salt is doubtless coeval with the abundance of marine animal remains which are disseminated throughout the mass of aluminous earth, and came originally from the ocean—the sulphuric acid from the iron pyrites coming in contact with the magnesian limestone, will fully account for the presence of magnesia, and for the saline matter usually designated by the name of Epsom salt; and as it is well known, that at a low temperature sulphate of magnesia will decompose muriate of soda, this will fully account for the origin of the alkali, which is the base of the sulphate of soda, or Glauber's salt, which always occurs in a state of solution in these waters.

From the best information which we have been able to obtain, we have learned that it is nearly one hundred years since the waters of Cheltenham were recommended for their medicinal qualities, and that the first well was railed in about the year 1718.

For many years subsequent to this period, the properties of these waters were treated of by various medical writers; and between the years 1770 and 1780 they acquired so much reputation, that the town became a place of great resort for invalids, from all parts of the kingdom.

But as the celebrity of the waters increased, it was soon found that the wells could not supply the quantity which was required by the increased demand; and in the year 1788 a new well was sunk by order of his present Majesty, known by the name of the *King's well.* At first the supply from this well was very abundant, but it afterwards decreased so much, that it was often drank out by the company in half an hour.

The waters of all the wells having thus continued to diminish in quantity, serious apprehensions were entertained that the company which had been in the habit of visiting Cheltenham would meet with such frequent disappointments, from the failure of the springs, that they would be induced to look out for some other watering-place, and that in a short time the town would be entirely deserted by the strangers who had formerly visited it, either for the purposes of health or pleasure.

At this period a gentleman of the name of Thompson, who had purchased a great part of the land in the vicinity of Cheltenham, determined to search for mineral water upon his own estate, and to try to supply the deficiency so much complained of. The success he met with soon led him to think of turning this discovery to his own advantage, as well as that of the public; and accordingly a new pump-room was erected, and no exertions were spared, until water was obtained sufficient for the supply of whatever company might resort to the town and neighbourhood.

Mr. Thompson, foreseeing the advantages which might be derived from this inexhaustible source, now built a laboratory, for the purpose of concentrating the waters, and extracting the salts from them in a crystalline form. He soon found, however, that a large quantity of water would be necessary, for affording a constant supply to the boilers; and accordingly was obliged to sink many fresh wells before this object could be fully attained. For, owing to the tenacity of the clay, the water will not find its way through it, for any considerable distance, so as to percolate from one well to the other. In consequence of this, the proprietor was under the necessity of sinking upwards of seventy wells, and laying down several thousand feet of pipes, before he could obtain that full supply of water which the laboratory required.

Conceiving that it was desirable to give some account of the situation of the wells—of the different strata cut through—and of the variation in the water, at different depths from the surface—we have obtained from the proprietor an account of the results in sinking the well which is situated nearest to

the laboratory, and this we copy, with the design of furnishing an idea of the nature of these wells in general.

After passing through the soil, they came to a bed of sand, which continued for twelve feet, at which depth fresh water was found; under this was a bed of blue clay, in which, at the depth of fifteen feet, or twenty-seven feet from the surface of the sand, a saline chalybeate water first made its appearance. This the workmen conducted into a distinct reservoir, cut on the side of the well, on purpose for its reception; and they arched it in such a manner, that a pump might be fixed in it so as to draw this water to the surface, without allowing it to mix with any other spring which might be discovered at a still greater depth. Having taken these precautions, the men then proceeded to sink lower; and when they had cut through four feet more of the clay, they came to another spring, of the same nature as the former, but much stronger in its saline properties. A separate reservoir having been prepared in the side of the well for this water also, as in the former case, the men proceeded to sink to the depth of forty-four feet more, in the same bed of clay, before another spring made its appearance. This water, which had then a pump fixed in it, was found to be more highly chalybeate than either of the former, and also to contain a much larger portion of common salt.—See Plate I.

Before we describe the process for preparing the Cheltenham salts from the waters of the saline chalybeate, as conducted at Mr. Thompson's manufactory, it will be necessary to give some account of the methods by which the products of the several springs are collected and brought to the laboratory.

Several wells having been sunk to the proper depth, at one hundred feet apart from each other, horizontal borings are then made from one to the other, and half inch leaden pipes are laid in the augur holes, until they become all connected with one main well. In this a pump is fixed, and the working cylinder is placed at a sufficient depth, to draw the water from all the collateral wells. Thus one pump is made to empty nine or ten wells.

Over each of these pumps a building is erected, to secure it from injury; and reservoirs, capable of containing one thousand gallons each, are placed among the wells, in the most convenient situations, for receiving the water. Into these reservoirs all the water from this vast collection of wells is driven by the several forcing pumps; and as these reservoirs are placed at a sufficient elevation, they empty themselves by small uninterrupted streams into a main pipe, which is conducted under ground through the fields down to the laboratory. When it arrives there, the pipe is bent upwards, until it comes high enough to empty itself into a leaden cistern, of about twelve feet square, and which is placed in a convenient situation, for supplying the boilers, without any further labour of bucketing or pumping, but merely by opening a stop-cock, as occasion may require.

The boilers which are employed for concentrating the waters, are very properly* made of wrought iron plates, securely put together with iron rivets. The first boiler is nine feet long, six feet in diameter, and four and a half feet deep. The second is six feet square, and four and a half feet in depth. The third is eight feet by three feet six inches, and two feet eight inches deep. These boilers are covered by plates of iron, united in the same manner; and each cover has an opening of about two and a half feet square, called a man-hole, for the purpose of cleaning out the precipitates from the boilers occasionally. Each man-hole is covered by an iron door, which moves upon strong massive hinges, and this door is screwed down, so as to make the boiler impervious to the steam which is constantly generated within. In the cover of the largest boiler an iron pipe, five inches diameter, is fixed, for the purpose of carrying off the steam; and this is conveyed underneath the laboratory to an adjoining building, for the purpose of heating the public baths. Smaller pipes are also fixed in the cover of this and the other boilers, for the collec-

* We say these are very *properly* made of iron, because we know, that in some establishments utensils of copper are employed for the preparation of medicinal salts.

tion of a sufficient quantity of steam, to be employed in warming the counting-houses, the dressing-rooms at the baths, and all the other rooms belonging to the establishment. The three boilers, which are placed end to end in one continued row, are heated by one fire, which is placed at one end of the largest boiler, and from this the heat is communicated to the other two in succession. When these boilers are charged with the mineral water, the fire is lighted beneath them, and as soon as the evaporation has properly commenced, the cocks are partially opened which connect with the large leaden cisterns, so as to allow a small stream of the mineral water perpetually to run into the boilers, and repair the waste of fluid which the evaporation constantly occasions.

When the evaporation from the large boiler has been thus continued for seven days and nights uninterruptedly, amounting to not less than ninety-six gallons every hour, a large cock in the room beneath is opened, and the whole contents of the evaporating vessel is let off into a capacious cooler, in which a strainer is placed, for the purpose of arresting the carbonate of lime, magnesia, and the other insoluble matter which had been precipitated from the fluid, by the operation of boiling. The magnesian precipitate, which is generally very abundant, is unfit for medicinal use, in consequence of the carbonate of lime which falls with it. The proprietor, therefore, treats it with sulphuric acid, which has the property of forming a soluble salt with the magnesian earth, and an almost insoluble one with the calcareous, by which means the lime and the magnesia are separated. The magnesia having thus been again brought into a state of solution, the operator draws it off by a syphon from the precipitated sulphate of lime, and carries it to the evaporating pan, where it is concentrated and prepared for crystallization. The liquor in the second boiler, when it is thought to be sufficiently concentrated, is run off and filtered in the same manner.

When the earthy salt has had time to subside, and the filtration is completed, which generally requires twelve hours

to accomplish, the filtrated liquor is pumped up into the small boiler, No. 3, for the purpose of being farther concentrated. In this vessel the evaporation is generally continued for a week, without allowing the liquor ever to boil in it. At the end of this period a pellicle usually appears upon the surface of the saline fluid, and this is considered by the operator as a sufficient indication that the lixivium has attained that point of concentration at which it ought to be withdrawn from the boiler, and set aside for the salts to crystallize.

For this purpose a cock fixed in the bottom of the boiler is opened, and the whole contents let down into a large receptacle of wood placed underneath it; when the boiler is again filled as before, for a repetition of the operation.

When this concentrated lixivium is removed from the boiler, it is allowed to remain undisturbed in the wooden cistern for twenty-four hours, that any magnesian or calcareous earth may subside, which had not been separated by the previous filtration. The liquor, perfectly transparent, and at about the temperature of 90°, is then drawn off and conveyed to the crystallizing vessel, which is a deep iron pan, five feet diameter, and lined at the bottom, and in its whole circumference, with marble, to prevent the salts from acquiring any stain. When this vessel is filled, a number of loose sticks are laid to float upon the surface of the liquor, for the salts to attach themselves to, that the crystallization may be distinct and not in a confused mass, as it would otherwise be at the bottom of the cooler.

When the crystallization, which requires from two to five days, according to the season of the year and the state of the weather, is thought to be complete, the mother liquor is drawn off, and poured into a number of wooden vessels, where it remains a few days, for the purpose of procuring a second crop of crystals. The whole of the mother liquor being thus removed from the large crystallizing vessel, the salts are then taken out with appropriate shovels, and put into baskets to drain, preparatory to their being carried to the stove to be dried for sale. This first produce of the Cheltenham waters

is known by the name of the "Cheltenham Alkaline Salts."*

When the second crop of crystals has been obtained, the mother liquor is removed to another part of the laboratory, and poured into several iron pans set within the ground, so as for the upper edge of each to be level with the floor of the building. Here, by a long protracted evaporation, the mothers become still more concentrated, and then the muriate of soda begins to shew itself in a pellicle at the surface of the liquor, and this continues to collect, repeatedly falling as it forms, until the whole of the muriatic salt is separated. As there is something curious in the construction of this apparatus, it may be worth while to describe it, before we proceed to examine the remaining processes of the laboratory.

When the proprietor found how large a quantity of steam would be produced by the salt-pans, it occurred to him, that instead of letting it escape into the atmosphere, it might be applied to several useful purposes. Accordingly, the earth under a part of the laboratory was removed, to the depth of about five feet, and the ground puddled with clay to make it hold water. A large iron pan was then fixed within this prepared bed, so as that it might be entirely surrounded with hot water; and a moveable grating was placed over it. A number of smaller iron pans, each three feet in diameter, were then fixed in the same bed of clay, in a long row against one of the walls of the laboratory. The whole of these being thus

* When these salts are designed for exportation to hot climates, they are deprived of their water of crystallization by the following process:—They are thinly spread upon boarded shelves, in a room heated by steam, to the temperature of 80°, where they are exposed to this warm atmosphere for three or four weeks, until they have sufficiently effloresced, so as to bear being moved with safety to a set of wooden racks fixed over the main boilers, where they are kept in linen bags, in a temperature of 120°, till the whole of the water is abstracted. They are then ground in a mill, to be described hereafter, and when brought to the state of almost an impalpable powder, they are put up in bottles of different sizes, and sold under the name of "Effloresced Alkaline Cheltenham Salts."

fixed, small arches of brick were turned over the remaining parts of the area. for the purpose of supporting the stone floor of the laboratory, which is laid on a level with the edges of the small iron pans just described.

Things being thus situated, an iron cylinder, five inches in diameter, as before mentioned, was fixed in the cover of the large salt pan, to receive the steam and conduct it under the floor of the building, for the purpose of heating the collection of iron pans already named, and producing an evaporation of whatever liquor might be put into them. In order to render the steam effectual for these purposes, the proprietor has contrived that a very small stream of cold water shall meet the large volume of steam exactly in the same spot at which it enters the shallow chamber underneath the laboratory floor; and this has the immediate effect of condensing the whole into a current of hot water. This current, which is never at a temperature below that of 190°, nearly fills the large space beneath the floor, and surrounds the whole of the iron vessels set within it; which are thus preserved at one uniform heat night and day, without any expense of fuel whatever. And when the condensed steam has thus done its office in the laboratory, it flows from thence to the baths of the proprietor, where it supplies one large swimming bath, and eight smaller baths, of various sizes, with a sufficient quantity of hot water to keep them at all times at a temperature fit for use. Not only this, but the hot water is in such abundance, as to occasion these baths perpetually to overflow, and the bathers to enjoy the luxury of a constant accession of fresh water.

There is another advantage which the baths of Cheltenham enjoy, in consequence of their vicinity to these chemical works, and which is known at few watering places in the kingdom; which is, that the visitors who prefer the private baths, whatever may be their number, may all have fresh water every day to bathe in; these baths being so constructed, that they may each of them be emptied in five minutes, and filled again with fresh warm water in ten minutes; and the hot water produced from the steam of the boilers is so abundant, that no person who visits these baths need ever bathe in the water

which had before been used for the same purpose. And that there can be no temptation for deception in this respect, is evident from the consideration, that at this place the hot water is always prepared without expense.

But to resume the account of the preparation of the Cheltenham salts. As soon as the muriate of soda has all precipitated from the mother liquor, the warm mothers are removed to a cold vessel of stone, where a pellicle of a new salt, sulphate of magnesia, soon begins to shew itself, and in six or twelve hours an abundant crop of yellow magnesian sulphate, fully charged with carbonate of iron, is obtained.

The next object is to separate the iron from the crystals of sulphate of magnesia; and to effect this, the workman dissolves them in a large portion of hot water. In this operation the oxygen of the air in the water, uniting with the black oxide of iron, converts this to the red oxide, which renders it insoluble by carbonic acid, and consequently incapable of colouring the salts in their next crystallization.

When the sulphate of magnesia has thus been purified from the iron, and has also been reformed by a second crystallization, it is put into baskets for the moisture to drain from it. As this species of salt is never sold from the Cheltenham laboratory in the form of crystals, the whole of it, when dry, is carried into a set of arches formed in the stack of brick work which supports the range of large boilers; and here it sustains a heat of not lesss than 100°, so that in the course of a few weeks nearly the whole of the water of crystallization will be dissipated.

When the salt has been thus dried, it is carried to a small mill moved by water, and similar to a common corn mill. Here it is ground between two horizontal stones, and reduced to the state of an impalpable powder. It is now considered to be finished, and is sold under the name of the "Effloresced Magnesian Cheltenham salt."

Another salt is still contained in the mother liquor, which is the *muriate of magnesia*, highly charged with iron. In order to turn this to account, the proprietor dilutes it with ten times its measure of hot water and sets it aside to purify. The hot water

instantly acts upon the iron, and as the iron precipitates, it carries all the other impurities down with it. In ten or twelve hours the lixivium becomes bright and nearly colourless, when it is carefully drawn off by means of a syphon, and treated with a solution of carbonate of potash for the production of carbonate of magnesia. But in order to do this in the best manner, the following measures are adopted.

There are five cast iron pans each 24 inches square, if measured at the top; 21 inches square at the bottom and 20 inches deep; in these the American pearl ash, or carbonate of potash, is dissolved by means of hot water. When the solution has been completely effected by repeated stirring, the whole is left for 10 or 12 days at rest, to afford time for the sulphate of potash and other impurities to subside and separate. During this period a large quantity of crystals of sulphate of potash will sometimes attach themselves to the sides of the vessels; but these are all carefully avoided by the operator when he draws off the alkaline lixivium; for if they were to become again dissolved in the liquor, they would not fail to contaminate the magnesia very materially.

When the alkaline lixivium is thus prepared and purified, a small portion of the solution of muriate of magnesia is put into a trial bottle, and some of the alkaline lixivium added to it by degrees, until all the magnesian earth is precipitated. This trial is made for the purpose of ascertaining not only the strength of the solution of muriated magnesia, but also that of the solution of alkali; that the workman may know how much of the carbonate of potash, any given quantity of the solution of magnesian salt will require for its complete decomposition. This having been ascertained, the clear solution of muriate of magnesia is measured into small square pans of iron lined with marble, and the appropriate quantity of the purified solution of carbonate of potash is added to it. This occasions a mutual decomposition of the two salts, and two new ones are produced, viz. muriate of potash which remains in solution, and carbonate of magnesia which precipitates.

When the carbonate of magnesia has entirely subsided, the solution of muriated potash is drawn off with a syphon, and the magnesian earth is washed with several successive portions of

hot water, until the last portion betrays no sign of any salt being dissolved in it. The precipitate, which is a carbonate of magnesia combined with water, is then taken out of the vessels and put upon cloth filters to drain. In 24 hours it is usually found to be sufficiently dry to be removed from the cloths, when it is taken to a warm chamber of the temperature of 106° or 110°, and spread out upon shelves made of a porous sand-stone, peculiarly well adapted for this purpose. Here, the cakes soon begin to lose their gelatinous appearance, and in the course of about five or six days most of the water which gave this preparation of magnesia the character of a hydrate, will have been absorbed; the carbonate of magnesia is then passed through lawn sieves to prepare it for sale.

Formerly, the solution of muriate of potash which results from the preparation of carbonate of magnesia was suffered to run away as of no value; but it has lately occurred to the proprietor of these works, that it might very advantageously be employed, together with the muriate of soda which is obtained from the spa water, in making a series of warm saline baths, which has long been an important desideratum with many individuals who visit this fashionable watering-place. Accordingly Mr. Thompson has prepared two large reservoirs, each 14 feet by 20 feet, and puddled them at the bottom and round their sides with clay to make them water tight; and in these he means to reserve from time to time, all the muriatic salts both muriate of soda and muriate of potash which his manufactory shall produce, together with all the spa water which he can spare, until he finds he has a sufficient quantity for the formation of the new salt-baths which he has in contemplation, and which he expects to be able to complete by the commencement of the ensuing season.

When the proprietor of these works found a considerable demand for calcined magnesia as well as for the carbonate, he put up a calcining apparatus for the purpose of preparing it, which we think deserves to be described. It consists of a strong iron cylinder six feet long, with a five inch bore, and which measures in diameter, from outside to outside, 10 inches. This

is *fixed* in brick work beneath the large salt pan, and passes directly through the fire, from which, it is defended, when not in use, by a row of fire bricks. Within this cylinder the carbonate of magnesia is placed by a bent iron shovel, made on purpose for the work, and which reaches from one end of this calcining oven to the other. When it has thus been filled with the magnesian carbonate, it is closed with an iron stopper; and for farther security a round cover of wrought iron slips upon the end of the cast iron, which makes the whole completely tight. A small orifice is then opened at the other end of the cylinder for the purpose of allowing the escape of the water and carbonic acid; the fire bricks are removed from the fire place, and the calcination commences. In about 3 hours the operation is finished, and every 12 pounds of carbonate produces six pounds of calcined magnesia. When the calcination is finished, if it is not intended to repeat the process, the fire bricks are immediately replaced to preserve the cylinder from the destructive action of the fire at the time when the calcination of magnesia is not going on.

Respecting the origin of the magnesia, it ought to have been remarked, that till within these five years no magnesian salt had even been discovered in any of the spas at Cheltenham. But about the year 1811 the manufacture of the Cheltenham salts, and the increase of visitors at the wells, had occasioned such a scarcity of mineral water, that Mr. Thompson determined to extend the search and to sink some wells at a greater distance from the pump-room, and in a quarter which had not yet been explored. Here he succeeded far beyond his own expectation; and when he came to examine the water of the new wells, he found them to contain not only all the principles of the old spas, but also to hold a considerable portion of muriate and sulphate of magnesia, neither of which salts had ever yet been detected in any of the springs in the vicinity of Cheltenham.

When Mr. Thompson had made this discovery, he determined to keep the water of the new wells separate for the use of the visitors at the pump-room, and to mix them with the waters of the old spas for the use of the manufactory. Accordingly, he

has a distinct reservoir at the pump-room for the magnesian water, and the visitors ask for it under that appellation; whereas it was found necessary to convey it under ground for more than a mile in leaden pipes* to the laboratory. When it arrives there it runs into the general reservoir, and when the whole is sufficiently concentrated by boiling, the various salts are separated, by what the chemist calls priority of crystallization.

Thus, the individuals who visit Cheltenham for medicinal purposes, whatever have been their predilections, may find here a collection of mineral waters which contain the principles of those at Tunbridge, Bath, Bristol, Lemington, Malvern, Harrowgate, and perhaps of every other public spa in the kingdom. To this circumstance it is owing that Mr. Thompson has been enabled to prepare such a variety of different salts from the waters of this very peculiar district; having always on sale six distinct saline preparations, as follow, viz.

I. Crystallized *alkaline* sulphats.

II. Ditto effloresced and ground to an impalpable powder for hot climates.

III. Magnesian sulphate, in a state of efflorescence.

IV. A murio-sulphate of magnesia and iron, in brown crystals, highly tonic.

V. Sub-carbonate of magnesia in powder; and

VI. Calcined magnesia.

It will be observed that in preparing these different articles for sale, there is such a separation of the various principles contained in the original water, that not one of them is similar to the water which is drank at the spa, and more especially, because the whole of the muriate of soda is thrown aside and employed in preparing the saline baths.

From these considerations we have judged it advisable to

* While examining the various processes for preparing the salts, the proprietor told us that he had formerly employed pipes of iron and also of wood, but that the one occasioned a turbidness in the water, and the other rendered it vapid and unpleasant; which reduced him to the necessity of substituting lead. But having intimated a doubt to him as to the safety of using it, we requested to see one of

recommend Mr. Thompson to fill one of his salt-pans with water from one of the magnesian wells, and having evaporated the aqueous part and obtained all the solid matter contained in it, to grind these mixed chalybeated salts together and offer them for sale under the name of the "original combined Cheltenham salts." We have advised this, because we conceive that the muriate of soda, which has hitherto been separated, and also a larger complement of the oxide of iron, may, for some constitutions, be very salubrious. Moreover, if this were done, all persons residing at a distance might at all times and in all seasons prepare a medicated water for themselves, which would possess nearly every property of the real Cheltenham waters. This Mr. Thompson has determined to carry into effect, as a matter of experiment, not doubting but that the various professional men who are in the habit of purchasing his salts, will soon make their report upon its value, when compared with the virtues of his other salts.

A careful analysis of the several waters of Cheltenham has afforded the following results.

No. I. The strong chalybeate saline water; the specific gravity of which is = 1,0092.

these pipes of conveyance taken up, that we might examine it. Accordingly, a leaden pipe which had lain in the ground for ten years, and had had a thousand gallons of mineral water pass through it every 24 hours, was removed from its situation for this purpose, and when it was slit open, it appeared to have a very slight coating of oxide of iron; but we could not perceive that the lead was at all eroded by the action of the water. For further satisfaction we referred the proprietor to the very respectable testimony of Dr. Jameson, who in his ingenious treatise on the Cheltenham waters has shewn the impropriety of using pipes of iron, and has informed us that "one half of the old well at this watering place is *lined with lead;*" and though he superintended its being opened to be cleansed in the year 1802, makes no observation on the fact of lead being employed; which he doubtless would have done if he had conceived that it was improper. See Jameson's Treatise on Cheltenham Waters, 1st edit. 1803, pages 56 and 62.

One wine pint contains 74 grains of dry salts,* consisting of

	Grains.
Muriate of soda - -	41,3
Sulphate of soda - -	22,7
Sulphate of magnesia - -	6,0
Sulphate of lime - -	2,5
Carbonate of soda and iron	1,5
	74,0

The pint yields about 2,5 cubic inches of carbonic acid gas. This water, after the carbonic acid has been separated, renders the yellow of turmeric slightly brown.

No. 2. The strong sulphureted saline water. Its specific gravity, after the separation of the gases, = 1008,5.

One pint affords on evaporation 65 grains of dry salts, containing

	Grains.
Muriate of soda - -	35,0
Sulphate of soda - -	23,5
Sulphate of magnesia -	5,0
Sulphate of lime - -	1,2
Oxide of iron - -	3
	65,0

Gaseous contents.

	Cubic Inches
Sulphuretted hydrogen -	2,5
Carbonic acid - -	1,5
	4,0

This water possesses the fetid odour of sulphuretted hydrogen. It renders tincture of galls slightly black, and a piece of gall nut suspended in it becomes surrounded with a blueish cloud.

No. 3. The weak sulphuretted saline water. Specific gravity after the loss of its gaseous contents = 1006.

* After having been kept for six hours at a temperature of 212°.

A pint affords 36 grains of dry salts, consisting of

	Grains.
Muriate of soda -	15,0
Sulphate of soda - -	14,0
Sulphate of magnesia -	5 0
Sulphate of lime -	1,5
Oxide of iron - -	5
	36,0

Gaseous contents.

	Cubic Inches.
Sulphuretted hydrogen -	2,5
Carbonic acid - -	1,5
	4,0

No. 4. The pure saline water, specific gravity = 1010.

One pint affords on evaporation 80,5 grains of dry salt, which is composed of

	Grains.
Muriate of soda - -	50,0
Sulphate of soda - -	15,0
Sulphate of magnesia -	11,0
Sulphate of lime - -	4,5
	80,5

This water scarcely yields any traces of iron.

No. 5. Sulphuretted and chalybeated magnesian spring, or bitter saline water.

Specific gravity after the loss of its gaseous matters = 1008.

One pint left a residuum on evaporation of 60 grains of dry salt, consisting of

	Grains.
Sulphate of magnesia -	36,5
Muriate of magnesia -	9,0
Muriate of soda - -	9,5
Sulphate of lime - - -	3,5
Oxide of iron - - -	0,5
Loss - -	1,0
	60,0

Gaseous contents.

	Cubic Inches.
Sulphuretted hydrogen -	1,5
Carbonic acid - -	4,0
	5,5

No. 6. Saline chalybeate drawn from the well near the laboratory.

Specific gravity after the loss of the carbonic acid = 1004.

One pint affords 34 grains of dry salts, containing

	Grains.
Muriate of soda - -	22,0
Sulphate of soda - -	10,0
Oxide of iron - -	1,5
Loss - - -	0,5
	34,0

Gaseous contents.

Carbonic acid about 10 cubic inches.

The waters No. 2 and 3 are pumped from the same well, but the suction pipe that raises No. 2 passes to the bottom, while that of the pump furnishing No. 3 dips only about three feet into the water.

As there is no spot in Great Britain which furnishes such a variety of mineral waters, and is so much resorted to by valetudinarians as the neighbourhood of Cheltenham, we have considered it necessary to be somewhat minute in our account of the methods adopted in the preparation of the various products above described, and also in the analyses of the different waters of the springs. We trust that the information we have been able to communicate will prove interesting to those who visit the district, and useful to such as may be engaged in similar objects of inquiry, and are happy in this opportunity of expressing our obligations to Mr. Thompson for the ready access which he gave us to his laboratories, and the assistance he lent to our pursuits.

London, March 8, 1817.

Art. V. *An Account of* Euler's *Method of solving a Problem, relative to the Move of the Knight at the Game of Chess. From a Correspondent.*

The Knight being placed on any given square of the chess-board, it is required at sixty-three successive moves, to cause it to move over the remaining sixty-three squares.

To most of those who are familiar with the Game of Chess, this curious question is perhaps well known, although the method of reasoning which Euler employed in discovering its solution, is, I believe, not so generally understood.

It may be remarked, that if we have any one course of moves, by which the knight may successively move over the sixty-four squares of the chess-board, and if the square with which it terminates, is distant from the square which commenced it, by one move of the knight, then, such a course will solve the problem; the course given, fig 1, Plate II. is of this nature, and may be called a re-entering-course.

Let us now suppose the knight is placed on the square marked 39, (fig. 1, Plate II,) then, since we are acquainted with this course, we may cause it to move on through the squares 40.41 . . &c. 64, and since it can move from the square marked 64, to that marked 1, it may continue its course from 64 to 1 . 2 . 3 . . . to 38, when it will have fulfilled the conditions. This course may conveniently be represented thus:

39 . . . . 64.1 . . . . 38.

It also appears, that the knight might have moved backwards from the square 39 to 38, and so on to 1, and from thence to 64, then through 63, &c. to 40. This course would be thus represented:

39 . . . . 1.64 . . . . 40.

The arrangement just given, furnishes, therefore, two courses from whatever given square of the chess-board the knight commences his course.

As it is a much more difficult matter to discover by trial, a re-entering course, than one in which the last square does

not communicate with the first, we shall first show a simple method of transforming any course of the latter species, into several different ones of the former kind. Let us take the course (fig. 2, Plate II,) in which the last square, 64, does not communicate with the first, 1. It may be remarked, that the square at which the knight finishes his course, may be changed in several ways, without altering the square from which he started; thus let us notice all the squares to which the knight might move from the last one, or that marked 64: these squares are 63, 31, and 51, of which the first, or 63, contains the move already employed, to arrive at 64, and is therefore of no use. Since the knight can move from the square marked 31, to that marked 64, let him make this move on his arrival at 31, after having passed through the squares 2. 3, &c. and after that let him pursue his course through the squares 64, 63, 62, &c. until he arrives at 32, which will now be the last one, and his new course will be represented thus:

1.2 . . . . 31.64.63 . . . . 32.

In a similar manner the move from 64 to 51, gives the course

1.2 . . . . . . 51.64.63 . . . 52;

and since the last square, 52, communicates by one move with the first, 1, this course is one of the re-entering kind, and it is, in fact, the course already given. If we had not already found a course of this kind, we might make new transformations on those just given. Thus, in the course

1 . . . . . 31.64 32,

the knight can move from the last square, 32, to the squares 43, 11, 31, 33. The number 43 gives the course

1 . . . . . 31.64 . . . . . 43.32 . . . . 42.

The number 11, furnishes the course

1 . . . . 11.32 . . . . 64.31 . . . . 12.

The third number, 31, gives the original course from whence we began, aud the number 33 causes no change.

In the last course, which ends with 12, the knight may move from 12 to 59, 41, 11, and 13; these furnish the following courses:

1 . . . . 11.32 . . . . 59.12 . . . 31.64 60

1 . . . . 11.32 . . . . 41.12 . . . 31.64 42

and since 60 communicates with the squares 61, 59, 9, 45, 25, 27, 13, and 53, we shall have several new courses ending with 10, 26, 46, 28, 14 and 54.

We have thus an easy method of discovering a great variety of new courses, from one given one, and this number might be much increased by inverting the order of each course.

This method of discovering re-entering courses, requires us to be acquainted with one which does not possess that property; now such a course may be determined in the following manner: beginning with any square, let the knight be moved successively over as many squares as he can, marking each square with a number; those squares which remain vacant, may be marked with the letters of the alphabet, as in fig. 3. In this case there remain two squares unoccupied, which are marked *a* and *b*. The course of the knight having moved over 62 squares, may be represented thus:

1 . . . . 62;

and considering 62 as the last square, let us transform this into other courses which terminate with other squares, until some of the final squares communicate by one move of the knight, with either of those marked *a* and *b*; but 62 communicates with the squares 9, 53, 59, 61, 23, 11, 55, and 21, whence we may deduce the transformations.

I.	1 . . . . 9.62	. . 10, which communicates with *a*.	
II.	1 . . . . 53.62	. . 54, which communicates with *a*.	
III.	1 . . . . 59.62	. . 60	
IV.	1 . . . . 23.62	. . 24	
V.	1 . . . . 11.62	. . 12	
VI.	1 . . . . 55.62	. . 56, which communicates with *a*.	
VII.	1 . . . . 21.62	. . 22.	

The courses marked I. II. and VI. include the square *a*, and by applying similar transformations to either of them, we may obtain others, which also include *b*; such is the following:

1 . . . . 9.62 . . . . 58.*a*.10 . . . 57.6

which arises from transforming

1 . . . . 9.62, . . . 10.*a*

into 1 . . . . 9.62 . . . . 58.*a*.10 57

where 57 communicates with *b*.

It is obvious, that the same method is applicable, whatever be the number of squares unfilled at the beginning; and the course thus obtained, may be transformed by the process explained at the commencement of this Paper, into others which have the property of returning into themselves: such are the figures 1 and 5.

After solving the question in the manner we have just stated, Euler adds to it, the following restriction, which renders it still more curious It is required, that the difference of the numbers which are placed in any two *opposite* squares, shall always be equal to 32. Note, each square has another which is opposite to it, and the two squares are so related, that a straight line drawn through their two centres, will always divide the chess-board into two equal parts. It is therefore required in this case, that the squares which contain the numbers 32, 33, 34 . . . . 64, shall be opposite to those in which the numbers 1, 2, 3, ... 31 occur.

In order to discover such courses we must put 1, 2, 3, &c. in the squares successively covered by the knight, and at the same time we must write the numbers 33, 34, 35, &c. in the opposite squares; continuing this as far as we are able, we shall find twelve squares remain empty, which may be filled by the letters A, *a*, B, *b*, C, *c*, D, *d*, E, *e*, F, *f*, arranged in opposite squares, as in figure 6.

We have here two separate series of squares, which indicate the successive moves of the knight:

58 . . . . 64.1 19

29 51

The square 19 communicating with 6, gives the transformations

51 . . . . 64.1 . . . . 6.19 . . . . 7.*f*. B. *d*. C.

26 . . . . 38.51 . . . . 39. F. *b*. D. *c*.

Since C communicates with the squares 8, 6, *d*, of the first series, it will furnish no new transformations; let us therefore omit the two last terms; and since it is sufficient to transform one series, because the other is determined by it, let us consider the series

58 . . . . 64.1 . . . . 6.19 . . . . 7.*f*.B.

where B communicating with 12 gives the course

58 . . . . . 64.1 . . . . . 6.19 . . . 12. B.*f*. 7 . . . 11. D. *c*.

but since *c* communicates with 16, we have

58 . . . . 64.1 . . . 6.19 . . . . 16.*c*.D.11. . . . 7.*f*.B.12. . . .15.*a*.E.

and the other series will be

26 . . . . 38.51 . . . . . 48. C. *d*. 43 . . . 39. F. *b*. 44 . . . 47. A. *e*.

which comprehends all the squares.

We must now endeavour to connect these two series together, so that the end of one shall communicate with the beginning of the other; for this purpose we observe, that E communicates with 62, and that the first series will then end with 63, which communicates with 26, the beginning of the other series; this transformation gives

58 . . . 62.E.*a*.15 . . . 12.B.*f*.7 . . 11.D.*c*.16 . . 19.6 . . . 1.64 . 63
26 . . 30.*e*.A.47 . . . 44.*b*.F.39 . . 43.*d*.C . 48 . . 51.38 31

and we have a re-entering course, which possesses the required property; see fig. 7.

To the condition respecting the opposite squares, we may also add the following: that the first half of the numbers 1 . 2 . . . 32 shall be contained in the first half of the chess-board, supposing it divided into two equal parts by a line parallel to one side passing through the centre; thus in fig. 8, all the numbers 1 . 2 . . . 32 must be situated below the line $\alpha\ \beta$, and all the other numbers above it. Let us begin by putting unity on one of the squares adjacent to the line $\alpha\ \beta$, then 33 must be placed on the opposite square, and causing the knight to move from 1 through various squares of the lower half of the chess-board, we arrive as far as 28; the remaining squares must now be filled up with the letters *a*, *b*, *c*, *d*, and these must, by various transformations, be included in the course: after several changes we may arrive at the following, which includes them all;

1 . . . 8.23. . . . 21.18 . . 20. *b*. 24 . . 28.17 . . 9. *a*.*c*. *d*.

and this again may be transformed into

1 . . . 8.23 . . . 21.18 . . 20.*b* . 24 . . 28.17 . . 15.*d*.*c*.*a*.9 . . .14

in which 14 communicates with 33, the beginning of the series above the line $\alpha\ \beta$, and the end of that series 64 also

communicates with 1; so that we have a re-entering series subject to both the restrictions.

The whole course is represented in Fig. 9.

It is not difficult to find other similar ones by the same method; and this course might be transformed in several ways, some of which are,

7 . . . 1.8 . . . 32

7 . . . 1.8 . . . 25.32 . . . 26

15 . . . 10.7 . . . 1.8.9.16 . . . 21.24 . . . . . 32.23.22

II.

ART. VI. *Some Experiments and Observations on a new Acid Substance. By* M. FARADAY, *Chem. Assistant in the Royal Institution.*

SIR H. DAVY, during his investigations on flame, discovered a method of exhibiting those combinations of bodies, which he had ascertained to take place at temperatures below that sufficient to inflame them; and whilst pursuing his enquiries on these new and singular phenomena, observed the formation of a peculiar acid body from ether. He has mentioned this body in a Paper read before the Royal Society, which will shortly be published; and he requested me to make some experiments on this substance, the results of which I shall now at his desire detail.

When a fine platina wire is heated and placed over the surface of ether, in an open glass, a pale lambent flame plays around it, and peculiar pungent fumes arise. Generally the heat of the wire is increased; it becoming at last red, and even white hot, and frequently inflaming the ether. If a heated glass or earthen-ware rod be placed over the surface of the ether, the pale flame is seen, and the vapours arise, but the effect soon ceases, from the cooling of the heated substance. The production of these fumes takes place at all temperatures, from a heat a little above the boiling point of mercury, until the ether is inflamed.

The vapours are very acrid and pungent, and very much resemble chlorine in smell: they affect the eyes in a manner similar to azotane: they redden moistened litmus paper. When a rod dipped in ammonia is held in them, they combine with the alkali, producing white fumes.

Sulphuric ether produces them most abundantly, but they may be obtained from the other ethers also. When nitric ether is used, as it inflames at a much lower temperature, it is more difficult so to manage the wire, as to produce the vapours: but if it be previously mixed with solution of potash, or other alkalies, then it succeeds as well as sulphuric ether, and the vapours formed, being unmixed with any nitrous vapours, are unequivocal in their characters.

Muriatic ether mixed with potash also produces the peculiar vapour, but not so abundantly as sulphuric or nitric ether. The wire easily retains its temperature, but does not very often inflame the fluid.

Acetic ether requires to be warmed before it will succeed well in preserving the wire at a red heat; and I have never yet observed the formation of the acid fumes from it.

I endeavoured to obtain a quantity of the acid in a pure form: for this purpose, some ether was thrown into a bladder, which was then filled with common air, and the mixture of air and vapour made to traverse a heated glass tube, containing pieces of platina wire and foil; the end of the tube descended into a bottle placed in a freezing mixture, and after passing many bladders of air slowly through the tube, the results were examined. Some charcoal remained on the pieces of platina; much carbonic acid had been formed and dissipated; and there was found in the bottle an aqueous solution of the peculiar acid.

The quantity obtained in this way, even after the process had been continued for some hours, was very small. The solution was clear and colourless, of a slightly acid taste and strong irritating smell. It reddened litmus paper, as did also its vapours. When heated the acid was quickly dissipated, leaving, on being evaporated to dryness, a slight coally mark on the capsule.

I distilled some of the solution from fused muriate of lime, hoping to procure the acid in its pure form, but obtained no decisive results. No permanent gas was given off, nor did any fluid distil over, until the acid was decomposed by the heat; but the quantity was too small to present distinct phenomena.

The solution of the acid added to ammonia, combined with it and formed a neutral salt, which, by careful evaporation, was obtained in the solid form. This was very volatile, rising at temperatures even below that of boiling water, and producing a peculiar fœtid smell, not much like the acid, but quite as unpleasant.

Muriate of lime decomposes the carbonate of ammonia, a triple muriate being formed, and carbonic acid separating; and as the new acid appeared to possess affinities in some cases not even so strong as those of carbonic acid, I hoped to obtain it pure by a similar decomposition; but on making the experiment, was still unsuccessful. The salt being distilled with fused muriate of lime, nothing came over but a small quantity of a fluid, possessing no acid properties, and appearing to be water: a decomposition had however taken place; for, on increasing the heat, ammonia was driven over; but here, as before, the small quantity I could use was against the experiment.

The acid solution added to potash and soda saturated them, and rendered them neutral. The solution with potash bore the application of heat for some time, until a certain degree of concentration being obtained, it began to decompose, and soon became strongly alkaline, the acid flying off. When in this state, if suffered to cool, it crystallised; and if left exposed to the air, soon deliquesced. If evaporated to dryness and heated, the subsalt was decomposed, and the acid destroyed.

The neutral alkaline solutions precipitated salts of silver and mercury, but not of other metals: the precipitates were soluble in a large proportion of water.

The acid solution decomposes the carbonate and subcarbonate of potash, soda, and ammonia, giving off carbonic acid:

it also decomposes the bi-carbonate of magnesia. It has no action on the carbonate of lime, even when newly precipitated; and in several other cases I have thought its affinities were weaker than those of carbonic acid.

The salts which it forms with the alkalies are decomposed by the common acids, and the peculiar vapour flies off; so much however is generally decomposed by the acid or heat (if evaporated), as to discolour the residuum.

From the small quantities in which I have been able to form it, I had no hope of ascertaining the proportion of its constituent parts; but from some minute experiments, I judge it to be composed of oxygen, hydrogen, and charcoal. A neutral solution of it with potash was evaporated to dryness and distilled, 2.17 cubical inches of gas were received over mercury, and much charcoal remained with the alkali in the retort. The gas rendered lime water turbid, and being agitated with solution of potash, became 1.6 cubical inches. This was inflammable, and burned with a light flame; four volumes of it detonated by the electric spark with six of oxygen, became two, which with four of nitrous gas became two; so that it appeared to be a mixture of carbonic oxide and hydro-carbonate. Oxygen, hydrogen, and charcoal may therefore be considered as the elements of the acid: the latter, from the quantity left in the retort, appearing to be in very great proportion.

The peculiar character of this acid is the irritating effect it produces on the eyes and nostrils. In this it somewhat resembles the oxalic acid, but is more pungent. This character belongs in part to its salts; at least its combination with ammonia, when volatilised, possesses similar powers, though not so strong

Among other fruitless attempts to obtain it, I used an atmosphere of oxygen and carbonic acid in place of common air, and receiving the gas over mercury, was in hopes of separating the carbonic acid by lime or some other agent, which would leave the new acid. I also distilled the neutral solution of it with potash, until rendered alkaline; but the very small quantities in which it is formed, and the ease with

which it quits its compounds, have prevented the performance of any decisive experiments upon it; and until some other process has been discovered for producing it, there is little hopes of its being obtained in the pure state.

Art. VII. *Natural and Statistical View of Cincinnati and the Miami Country.* *By* Daniel Drake. Cincinnati, 1815.

Cincinnati, the metropolis of the Miami country, within the Ohio state, is situated on the northern bank of the Ohio, 7° 24′ 43″ west of Washington. The Ohio state lies along the right bank of the river from which it takes its name, and its soil is the richest of North America; and is bounded by Pensylvania, Virginia, and Kentucky, the Indiana and Michigan territories, and Upper Canada. This state was admitted into the Union in 1803. The capital is Chilicothé, about sixty miles up the Ohio.

It was not till the year 1788 that any settlement was begun within the present limits of the state of Ohio, in which year settlements were commenced, and were extended along the Muskingum and Miami rivers, but which, till the Indian treaty of Greenville in 1795, they proceeded slowly: the causes, however, which precluded a rapid increase of population being removed, the advancement of both the population, and the extent of land brought into cultivation, since that time, has been beyond example; the former amounting to more than 300,000, and the latter extending over nearly 20,000 square miles, already rising in many parts to refinement.

Of the different towns in this state already far advanced, Cincinnati is one of the most important, and one which has already made the most rapid strides in the extended course of civilization of this part of the American continent. We consider Mr. Drake's work one of considerable interest: he has with great good sense and apparent care furnished the outlines

for a natural and statistical history of this important state. Independent of its intrinsic merit, the work is of peculiar value, inasmuch as it affords of itself direct proof of the progress which that country has made in improvement; and furnishes in every page satisfactory evidence of the wisdom of the American government, in the rules they have laid down for the happiness of its citizens. With this preface, we shall present to our readers such information from this work as we think most deserving of notice, and as our limits will admit.

In the Ohio state the soil is fertile, the price of lands low, the title to it secure, slavery excluded, and labour dear. The following is stated as the geometrical ratio of increase of population of the Tennesee, Kentucky, and Ohio states, lying nearly in the same meridian, and equally distant from the parent states. Tennesee, from 1791 to 1800, increased at $12\frac{3}{4}$ per cent. per annum (doubling in six years); from 1800 to 1810, at $9\frac{1}{2}$ per cent. per annum (doubling in eight years); and since at a diminished rate, which will take about eleven years to double. Kentucky, from 1790 to 1800, increased at $11\frac{6}{10}$ per cent. (and doubled in less than seven years); from 1800 to 1810, at $6\frac{3}{10}$ per cent. (doubling in eleven years); and since at a diminished rate, which will require, for the period of doubling, about twenty-three years. In Ohio, from 1790 to 1800, the population augmented at the rate of $30\frac{1}{4}$ per cent. (doubling in less than three years); from 1800 to to 1810, $18\frac{1}{2}$ per cent. (nearly doubling every four years); and since 1810 the probable rate is, that it will be again doubled in ten years.

The state is divided into counties, each of which has already its county town, which is described; and each town has a printing-office, court-house, and post-office, with public buildings; and most of them publish a weekly paper.

The grains are, Indian corn, wheat, rye, oats, and barley, yielding of the first, in some cases, one hundred bushels per acre, and on an average, forty-five; wheat is generally raised, and well adapted to the climate, twenty-two bushels the average, and the maximum forty: the weight 60lb. per bushel. Cider is made in large quantities; hemp and flax are grown;

the meadows are luxuriant; white clover and spear grass are the most generally cultivated, yielding two tons per acre; the pastures admirably adapted to cattle and sheep; and hogs are fattened on the fleshy roots of the prairie. Agriculture must, for the present, be considered as in its infancy.

In ascending from the surface of the Ohio, when low, to the top of an adjoining hill, first a region of tabular limestone, and argillaceous slate is observed; then a tract of alluvion compound of loam and clay, succeeded by a tract of the same kind more ancient, consisting of sand and gravel; the same strata are found exhibited by the bed of the river, surmounted by a stratum of loam, supporting occasional masses of primitive rocks.

The calcareous or limestone region is the largest perhaps in the known world. Parallel to the meridian, it extends, with few interruptions, but with considerable variations of character, from the shores of Lake Erie to the southern part of the state of Tennessee, and probably to the cape of East Florida, as the rocks of the celebrated reef, bordering that promontory, are stated to be calcareous. From the Muskingum and Great Sandy on the east, this formation extends westward beyond the state of Ohio; but to what distance, has not been ascertained. After passing the Great Miami, in this direction, the strata become disjointed, and lose their continuity, but show themselves, occasionally, even beyond the Mississippi.

The strata throughout this extensive region agree in having a horizontal position, and in containing marine remains. The lime afforded is of sufficient strength, but dark, and is in strata from one to eighteen inches thick, alternating with layers of clay slate. Good iron ore has been found, and specimens of silver ore have been dug up. The alluvial formation of this country is the exclusive depository of the remains of the huge quadrupeds, now unknown; the granite and other primitive rocks, are found in blocks on the surface, sometimes solitary, and at others piled in large masses. The question how these primitive rocks became transported, is a subject of much theoretical speculation; the country north of the great lakes is represented by Mr. Mackenzie as granite; the

secondary strata of this region indicate it to have be once a sea, and the declivity from near the lakes to the Gulph of Mexico favours the supposition, that at some former period there were currents over this part of the continent from north to south, and by these currents the masses of primitive stone may have been brought down embedded in ice and deposited where they now are. The climate of the Miami state participates with all those adjacent; the average state of the thermometer is 54; the winters in general mild, though the Ohio is occasionally shut up by ice.

The Ohio countries have been considered warmer in the same parallels than the Atlantic states, by Mr. Jefferson, Volney, and several other writers. This idea is combated by Mr Drake at some length, and he appears to have very diligently collected several curious facts relating to the climates of the two regions, and concludes, that though there is a difference in the climates, it consists more in the distribution than the absolute quantity of heat.

North America is traversed by two ranges of high mountains, the Allegheny and Chippewau. They are found near the eastern and western sides of the continent, widely separated; but resemble each other in diverging from the meridian, in opposite directions, at the same angle, in lying about equal distances from the Atlantic and Pacific oceans; and in preserving, throughout their whole extent, a parallelism with the coasts, to which they are respectively contiguous. The western, or Chippewau range, is the highest and most extensive; originating near the arctic circle, and spreading into elevated table land in Mexico. The Alleghenies commence immediately south of the Gulph of St. Lawrence, in the 48th degree of north latitude, and are lost in the 34th or 35th degree between the state of Georgia and the Mississippi river. In the latitude of Cincinnati, these ranges are about 1300 miles asunder. The intermediate country is bounded on the south by the Gulph of Mexico, and on the north by a chain of lakes stretching to the north-west, from the 42d to the 60th degree of latitude.

From this arrangement of mountains and lakes, results a division of North America into several great regions: 1. The mountainous,

consisting of two distinct and distant ranges; neither of them so high as to be covered with snow in the summer. 2. The western maritime, lying along the Pacific ocean. 3. The eastern maritime, extending from the Alleghenies to the Atlantic ocean, and naturally divisible into three sections; the northern, middle and southern. The rivers of the first, run nearly from north to south; those of the second and third, from north-west to south-east, leaving the mountains at right angles. 4. The lakes, and immense wilderness situated beyond them. 5. The valley or basin of the Mississippi bounded on the west, east, and north, by the regions just named. Being thus surrounded, the climate of this extensive tract must necessarily participate of all those which are adjacent. The mountain districts produce some of its peculiarities; but more are perhaps attributable to the region of snow and ice and half frozen lakes, in the north.

Considered without reference to the others, the central or Mississippi district, may be characterized as a plain from 800 to 1000 feet above the ocean, depressed in the middle from north to south, cut in various directions into numerous vallies, by streams of every width, generally covered with trees in the eastern, and with herbaceous plants in the western parts; arid and rolling in the south-east; dry and level in the west; marshy to the north, and wet to the south.

The prevalent winds of the interior, come from between south and west. Some of them are from the Gulph of Mexico, but the greater number appear to consist of air which in conformity to a general law, is moving eastwardly, and suffers deflection to the north by the vallies of the Mississippi and Ohio. The winds between north and west are next in prevalence, and consist of two varieties; that which attends or follows thunder gusts and other storms, and is supposed by Mr. Volney to descend from the higher regions of the atmosphere; and that which comes from beyond the sources of the Mississippi, and frequently continues for several days. The prevailing winds of the middle Atlantic states are between west and north. They consist of the real north-west, which traverses the lakes and loses much of its rigor, which however, it reacquires in ascending the Alleghenies, of the mountain or alpine atmosphere, frequently rolled

down towards the ocean, and of the south-west wind of the interior, converted by the vallies of the eastern rivers into a direction north of west. The west wind of both regions possesses nearly the same qualities; but from having traversed an additional range of mountains in reaching the Atlantic states, must be colder and drier there than in the interior. The east, south-east, and north-east winds of the Atlantic states, taken together, prevail more, and are warmer and damper than in the interior.

The violent north-east and south-east storms of the Atlantic states, are unknown in the western. In the quantity of water that falls in the two regions, there is probably not much difference. The south-west wind is the cause of great rains in the latter, and the north-east of still greater, perhaps, in the former. In the latitude of the Ohio state more rain falls west of the mountains, and more snow east of them. In the interior there is more cloudy weather, and greater atmospheric humidity. In thunder gusts, and other electrical phenomena, in droughts, and in the periods at which most agricultural operations are performed, there is perhaps no material difference.

The plan of Cincinnati is laid out partly on the plan of Philadelphia; the main streets are 66 feet wide, and the value of property in every part of the town is daily increasing: it is advantageously situated for procuring every material for building; the bed of the Ohio affords excellent limestones; fine marble is brought by water from the cliffs of Kentucky river; free stone of a good quality is already freighted for a small sum from near the intersecting of the Scioto with the Ohio. Clay for bricks, and lime and timber are abundant. In 1815 there were already built 1100 houses, of which, besides other buildings, 20 were stone and 250 brick; ornamental buildings were began; water and wood for fuel are abundant: coal brought from Pittsburgh is only used in manufactures. The markets, which are numerous and frequently held, are well supplied. There is no iron foundery, but the town is well supplied with iron, manufactories of cotton, and every other article of domestic consumption abound and are rapidly increasing; and in 1815, large quantities of manufactures were exported. A considerable manufacturing company is established; flat bottomed boats and

barges are employed on the river in commerce, but steam boats are already beginning to be worked. Flour, pork, and spirits are the chief articles of expoitation; there are three banking companies, three weekly papers. One 36th part of the state lands has been granted by the general government for the use of schools, and large national Lancasterian schools have been opened; a public library has also been established.

Pleurisy and Peripneumony are the most frequent diseases in winter, and are generally complicated with bilious affections: colds and other affections of the throat produced by change of weather are common: the premature decay of the teeth and pains in the jaw, which in parts of North America constitute an eighth part of the diseases, are not here prevalent: remitting and intermitting fevers prevail in autumn, especially along the water courses. The cholera infantum is more fatal to children than any other complaint; next come convulsions and croup.

Of adults, the greatest number die of bilious and typhus fevers; with pulmonary inflammation, and with affections of the liver, stomach, and bowels.

It may reasonably be presumed, supposing population to increase in its present ratio, that many of the villages which have sprung up within 30 years, on the banks of the Ohio and Mississippi, are destined, before the termination of the present century, to attain the rank of populous and magnificent cities. A reference to the importance of the Mississippi in the American continent, renders this supposition plausible; the vast extent and number of its branches (many of which exceed in length the largest rivers in Europe); the general direction of the main trunk, nearly from north to south, passing through more than 15 degrees of latitude in the temperate zone, the diversities of aspect, and inexhaustible fertility of the region which it irrigates; the boundless and perennial forests, which in the east, and in the north, overshadow its sources; the numerous beds of coal and iron which enrich its banks; the reciprocal ties and dependencies, which can never cease to operate, between the inhabitants of its upper and lower portions; the numerous states which will possess in its navigation, a common interest, that must for ever constitute a bond of political and commercial amity.

Of all the ramifications which enter into the composition of the Mississppi, the Ohio will unquestionably retain for ages, the highest rank. Mr. Drake, with an enthusiasm and a partiality natural to every patriotic citizen, observes, "our Atlantic brethren will behold with astonishment, in the green and untutored states of the west, an equipoise for their own. Debarred, by our locality, from an inordidate participation in foreign luxuries, and consequently secured from the greatest corruption introduced by commerce, secluded from foreign intercourse, and thereby rendered patriotic; compelled to engage in manufactures, which must render us independent; secure from conquest, or even invasion, and therefore without the apprehensions which prevent the expenditure of money in solid improvements; possessed of a greater proportion of freehold estates than any people on earth, and of course made industrious, independent and proud; the inhabitants of this region are obviously destined to an unrivalled excellence in agriculture, manufactures, and internal commerce; in literature and the arts; in public virtue, and in national strength!"

It was reserved for the Americans to decide, by their conduct and example, the important question—whether societies of men were really capable of establishing good government from reflection and choice; or whether they were for ever destined to depend for their political institutions on accident and force?——We do not think an account of the natural and civil condition of an infant state, in the interior of a remote continent, as out of place in a Journal of Science: we have indulged ourselves in details respecting its political state, because, convinced as we are, that the cultivation and advancement of science and the arts depend on the safety and happiness of individuals, which can only be secured by civil and political freedom, we persuade ourselves that such details will not fail to interest our readers.

Art. VIII. *Lithography. To the Editor.*

The art of printing on stone was first introduced into this country about fifteen years ago, by a person of the name of André, who obtained a patent for the invention, but which, of course, could not have been sustained, as the art had been

long practised on the Continent. Several sketches were made by our eminent artists, and a periodical work was published by M. André, of impressions from stone, and which, on his leaving this country, was continued by Mr. Volwieler, his successor, who finding the profits fall short of his expectations, left this country some time since; and on his departure, a poor person of the name of Redman, who had been in the employ of M. Volwieler, was instructed by him in the process, and was engaged in the Quarter-Master-General's office, for the purpose of printing plans, &c. The hope of greater gain, tempted him to quit his situation. He has not however, I believe, reaped, as yet, much profit from the concern. Some others have constructed presses, and printed from stone, but Redman is unquestionably the most skilful workman. When this art was first introduced into this country, it was expected that considerable benefit would result from its practice. In many instances, the expense attending engravings, precludes the possibility of giving publicity to works on science, and in others, considerable sacrifices are made, in order to bring out works which, but for the expense of the engravings, might have yielded the author a return for his labours. It should seem, however, from the total want of encouragement this art has met with here, either that it is not fit to supply the place of copper-plate engravings, or wood-cuts, or that the difference of expense is so inconsiderable, as not to be of moment. It was said, that the engravers had united to prevent the art being brought into use in this country. It is however, of course, a matter of absurdity to suppose, that the few members of any particular trade, should be able to prevent the exercise of an art, by which that which is required, could be procured equally serviceable, at one tenth part of the price. The fact is, the art of printing on stone does not appear ever to have been practised in perfection in this country, as will appear by reference to the works after noticed. The short outline of the process appears to be as follows. A slab of white lias, (Bath stone) about an inch thick, is rendered perfectly level, and polished with fine sand, or some other sub-

stance, and this stone is drawn on with a pen, and a prepared liquid of the consistence of common ink, and with the same facility: after this, the stone is washed over with a diluted nitric acid, which slightly corrodes that part of the stone which has not been drawn on with the pen (the liquid repelling the acid, having wax in solution); and the stone is then saturated with water, and the common printing ball is dabbed over it, as in type printing, and the ink adheres to such parts as have been drawn on, (the other parts of the stone being wet, repel the printing ink); the impression is then taken by passing the stone through a press, with a single cylinder. When the print is wished to resemble a chalk drawing, the stone is left rather rough, by using a coarser sand to polish it; and instead of ink and a pen being used, a prepared pastil, of the same substance as that with which the mixture used in drawing with a pen is made, is substituted, with which a drawing is made on the stone. From this, it appears, that the making the drawing on the stone, is accompanied by no more inconvenience than a drawing on paper with pencil or a pen: but as circumstances may render it inconvenient to make the drawing on the stone, there is a prepared paper, on which the drawing may be made, either with a pen or chalk, and which the printer can transfer on the stone; and this method has the advantage of reversing the drawing, by which means, the impression produced, corresponds with the original design. As it is difficult, even with a steel pen, to make a very fine line on the stone, where that is requisite, it is better to cover the stone over with a thin mixture of gum-water and lamp-black, and after it is dry, the design may be sketched with the point of an etching needle, in the same way as on copper, scratching through the covering of gum, and then rubbing the printing ink on the surface of the stone; it only adheres in the parts where the gum has been scratched away, and when the stone is soaked in water, the gum dissolves and washes off, leaving the design traced in printing ink on the stone, which, when dry, is printed from in the mode before mentioned. It should seem, however, that notwithstanding the apparent

simplicity of this process, there must be yet some considerable discoveries to make in the detail, as nothing has been produced in this country, which can, in respect of execution, be compared to the works produced on the Continent.*

It is obvious, that supposing the impression produced, is equally fit to answer the purpose required, the whole expense of engraving may be saved, as the artist may himself, at once, make the design on the stone; besides this, the stone is in no wise worn by printing, and any number of prints may be taken with it. Nothing resembling the tone, or effect of the fine productions of line engraving, can be produced; but an inspection of any of the works before noticed will shew that it is admirably adapted to represent subjects of natural history, outlines, designs, plans, &c. The art is also applicable to the multiplication of writings, as the subject required to be printed, may be written on the prepared paper before noticed, and transferred on the stone, and printed without the least delay, and at no other expense than the mere printing. At Munich, where this art is principally practised, all the proclamations, &c. relating to the State, are thus printed.

We have just learnt, that Mr. Ackerman of the Strand, has procured a person from Munich, who perfectly understands the mode of printing from stone: and that, in a short time, Mr. A. means to print in this manner for the public.

Art. IX. *Journal of a Voyage up the River Missouri, performed in* 1811. *By* H. B. Brackenbridge, Esq. *Author of Views in Louisiana. Second Edition.* Baltimore, 1816.

On the annexation of Louisiana to the United States, an expedition was, in May 1804, sent, under the direction of

* All the prints in the work of Spix, on Craniology, and the Bavarian Flora, printed at Munich, (both in the library of Sir Joseph Banks) are impressions taken from drawings on stone, and which are proofs of the perfection which can be attained in this

Captains Lewis and Clarke, with directions, after exploring the Missouri, from its conflux with the Mississippi, to its sources, to proceed across the mountains to the first navigable river on the west side which they should be able to follow to the ocean. This was accomplished, after a journey of 3000 miles up the Missouri, to its source, struggling against the stream of that impetuous river, and after an arduous journey over the stony mountains which form the line of partition between the waters of the Atlantic and Pacific Ocean. The passage up the river, occupied from the 18th of August to the 7th of October, when they embarked again on one of the branches leading to the Columbia, and on the 7th of November, first got sight of the Pacific.

Before this expedition of Lewis and Clarke, none were found adventurous enough to penetrate, more than a few hundred miles, that extensive portion of the Continent, passed through by the Missouri. After the return of those celebrated travellers, several Indian traders were induced to extend the sphere of their enterprise, and one of them, Manuel Lisa, ascended the Missouri almost to its source. These enterprising individuals meeting with considerable success, the Missouri Fur Company was formed. The Company engaged about two hundred and fifty men, Canadians and Americans; the first for the purpose of navigating the boats, the latter as hunters. In the spring of 1802, they ascended the Missouri in barges, and left trading establishments in the Sioux country, also among the Arikaras and Mandans. After this, they proceeded with the main body to the three forks of the Missouri, about three thousand miles from its source. The country about the sources of the Missouri, forms a part of the tract wandered over by a nation of Indians, called the *Blackfeet*, a savage race, who have conceived the most deadly hatred to the Americans, partly owing to an unfortunate rencontre between one of the natives and Captain Lewis, who killed one of them by a shot from his rifle. It was not long after the establishment

art. Mr. White, of Brownlow-street, Holborn, print-seller, also has a large work of prints from original drawings, published at Munich, executed on stone.

of the Company, and their building a fort, before the Black-feet commenced hostilities; and at length the party was reduced to about sixty persons, by the detachments left at the different trading establishments below, and by persons sent off with such furs as had been collected; added to this, about twenty had fallen in the different skirmishes with the Indians. Mr. Henry, one of the chief members of the Company, finding his situation extremely precarious, crossed the rocky mountains, and established himself on one of the branches of the Columbia, where he remained until the spring of 1811, the period at which Mr. Brackenbridge ascended the Missouri.

It being at this period a prevailing opinion that the affairs of the company were nearly ruined, in the spring of 1811, they determined to make one more effort, and if possible retrieve their losses and to carry relief to their distressed companions and bring them home, Mr. Henry and his party not having been heard of for more than a year. Manuel Lisa, a Spaniard, was chosen to undertake this arduous task. A barge of twenty tons was fitted out with merchandize to the amount of a few thousand dollars. Mr. Brackenbridge was tempted to join this expedition. The party set off from the village of St. Charles, on Tuesday, the 2nd of April, 1811. The flood of March, which immediately succeeds the breaking up of the ice, was still high. The barge was the best that ever ascended the river, and manned with twenty stout oars-men. M. Lisa had been a sea-captain: the party in the whole consisted of twenty five persons. The equipage was chiefly composed of young men, several of whom had made a voyage to the upper Missouri. They were completely prepared for defence: these precautions being deemed necessary from the hostility of the Sioux bands, who had committed several murders and robberies on the whites: Mr. Wilson P. Hunt had set off with a large party twenty three days before, on his way to the Columbia, and they hoped to overtake him before he entered the Sioux nation; in order to join company in passing through the haunts of these wandering nations.

Lisa's party had on board a Frenchman named Charboneau, with his wife, an Indian woman of the Snake nation, both of

whom had accompanied Captains Lewis and Clarke to the Pacific, and were of great service. The woman was of a mild and gentle disposition, greatly attached to the whites, whose manners and dress she tried to imitate, but had become sickly, and longed to revisit her native country; her husband also, who had spent many years amongst the Indians, had become weary of a civilized life.

The party exerted themselves to the utmost, anxiously wishing to overtake Mr. Hunt. On the 23rd, about noon, they espied at some distance before them on a sand bar, a number of persons, whom they at first took to be Indians, but on a nearer approach recognised to be whites. On coming to the spot, they found it was one of the Missouri company's factor at the Mandan village, who was descending with five men, in a small batteau, loaded with peltry. From him they learnt that with the exception of the Mandans, Arikaras, and one or two small tribes, all the nations of the Missouri were inimical to the whites, and that the Sioux had fired on them as they passed; and they also learnt that Mr. Henry was then over the mountains, in a distressed situation, and that he had sent word of his intention to return to the Mandan village in the spring, with his whole party. Sunday the 20th of June, after incredible toil in struggling against the rapid currents, Lisa's barge joined Hunt's party; they had fortunately in the night passed all the Sioux bands, who had been seen by Hunt, but probably found his party too strong to attack.

Mr. Nuttall, a gentleman known in this country by the number of curious vegetables which he has contributed to our collections, and a Mr. Bradbury, a naturalist, accompanied the party of Mr. Hunt, who was also joined by two persons of the name of Crook and M'Clelland, adventurous hunters, who had wintered on the banks of the Missouri. On the 26th of June they reached the fort of the Missouri company above the Mandan villages, 1640 miles from the mouth of the Missouri. They had now reached the utmost point of their voyage, for though it had been at first intended to proceed to the cataracts of the Missouri, for the purpose of attempting a treaty with the black-foot Indians, the information received from Mr. Henry

had produced a change in Lisa's intentions. He resolved to wait for him at this place, or at the Arikara village; and in the mean while, arrange the affairs of the company.

Mr. Hunt determined to purchase some horses at Arikara, and proceed by land to the Columbia, being assured by some hunters this would be the best route.

Mr. Brackenbridge being tired of this wandering life, returned with two boats loaded with skins to Port Louis, which had been dispatched by Lisa; he commenced his journey on the last day of July, and arrived in August, having performed 1440 miles in 14 days.

We have received considerable pleasure in the perusal of the journal of Mr. Brackenbridge; it is written in an unaffected style, and the appearance of the wonderful country through which the party passed is well described. Mr. Brakenbridge has no pretensions to science, "the voyage," he observes," was undertaken by me in the spirit of adventure which characterises so many of my countrymen." We extract the following description of the return of a party of Indians from battle as a fair specimen of his style.

"In the mean while a stilly suspense reigned throughout the village, all sports and business were suspended, and it resembled a holiday in one of our towns. We at length perceived the warriors advancing by the sound of their voices over a hill, about a mile below our encampment. In a short time they made their appearance; at the same time, the inhabitants of the town moved out on foot to meet them. I accompanied them for some distance, and then took a favourable position where I might have a full view of this singular scene. They advanced in regular procession, with a slow step and solemn music, extending nearly a quarter of a mile in length, and separated in platoons, ten or twelve a breast, the horsemen placed between them, which contributed to extend their line. The different bands of which I have spoken, the Buffalo, the Bear, the Pheasant, the Dog, marched in separate bodies, each carrying their ensigns, which consisted of a large spear, or bow, richly ornamented with painted feathers, beads, and porcupine quills. The warriors were dressed in a variety of ways, some with their cincture and crown of feathers, bearing their war clubs, guns, bows and arrows, and painted shields: every platoon having its musicians, while the whole joined in the song and step together, with great precision. In each band there were scalps, fastened to long poles: this was nothing more than the few scalps they had taken, divided into different locks of hair, so as to give the semblance of a greater number. The appearance of the whole, their music, and the voices of

so many persons, had a pleasing and martial effect. The scene which took place, when their friends and relations from the village, mingled with them, was affecting. These, approached with song and solemn dance, as the warriors proceeded slowly through their ranks: it was a meeting of persons connected by the most tender relations. Fathers, mothers, wives, brothers, sisters, caressing each other without interrupting for a moment, the regularity and order of the procession, or the solemnity of the song and step! I was particularly touched with the tenderness of a woman who met her son, a youth wounded, but who exerted himself to keep on his horse, and from his countenance one might have supposed nothing had been the matter with him. She threw her arms round him and wept aloud. Notwithstanding the young man expired, shortly after being brought to the medicine lodge; for it is the custom to carry such as have been wounded in battle, to be taken care of in this place, at the public expense. As they drew near the village, the old people who could barely walk, withered by extreme age, came out like feeble grasshoppers, singing their shrill songs, and rubbing the warriors with their hands. The day was spent in festivity by the village in general, and in grief by those who had lost their relatives. We saw a number of solitary females, on the points of the hills round the village, lamenting in mournful wailings, the misfortunes which had befallen them. For the two succeeding days the village exhibited a scene of festivity; all their painted shields and trophies, were raised on high poles near the lodges, and all the inhabitants dressed out in their finery; all their labours and sports were suspended, and the whole joined in the public demonstrations of joy, while music, songs, and dances were hardly intermitted for a moment.

About the latter end of October Lisa arrived at St. Louis; Mr. Henry had joined him at the Arikara village, having passed the mountains early in the spring, and having encountered incredible sufferings and dangers. Lisa had left trading establishments with the Sioux below the Cedar island, as well as with the Mandans and Arikaras. This immense tract of country has now become the theatre of American enterprise; there prevails amongst the natives west of the mountains, a spirit of wild adventure; the American hunters constituting a class different from any people known, to the east of the mountains; the life they lead is exceedingly fascinating, the scene ever changing, and confined by no regular pursuit, their labour is amusement.

We add to our account of Mr. Brackenbridge's Journal, a short statement of the fate of Mr. Hunt's party, in their journey from the banks of the Missouri to the Columbia,

together with the account of the return of Messrs. Crooks and M'Clellan, from the Company's settlements on the Pacific to the Massouri.

Mr. Hunt and his party having purchased 80 horses, departed from the Arikaras, on the 18th July, sixty persons in number, and 86 horses. In this situation they proceeded for five days, having crossed in that time two considerable streams, which joined the Missouri below the Arikaras, when, finding an inland tribe of Indians, they procured from them an addition of forty horses. Steering about W. S. W. they passed the small branches of Big River, the Little Missouri above its forks, and several tributary streams of Powder River, one of which they followed up; they found a band of the Absaroka nation encamped on its banks, at the foot of the Big Horn Mountain.

For ammunition and some small articles, they exchanged all their lame for sound horses, with these savages. The distance from the Arikaras to this mountain is about four hundred and fifty miles, over an extremely rugged tract, by no means furnishing a sufficient supply of water; but during the twenty-eight days they were getting to the base of the mountain, they were only in a few instances without abundance of buffalo meat.

Three days took them over the plains of Mad River, which they followed for a number of days, and then left it where it was reduced to eighty yards in width, and the same evening reached the banks of the Colorado or Spanish River. Finding herds of buffalos, at the end of the third day's travel on this stream, the party passed a week in drying buffalo meat for the remainder of the voyage, as, in all probability, those were the last animals of the kind they would meet with. From this camp, in one day, they crossed the dividing mountain, and pitched their tents on Hoback's Fork of Mad River; and, in eight days more, having passed several stupendous ridges, they encamped in the vicinity of the establishment made by Mr. Henry, in the fall of 1810, having travelled from the main Missouri, about nine hundred miles in fifty-four days.

Here, abandoning their horses, the party constructed

canoes, and descended the Snake River, (made by the junction of Mad River, south of Henry's Fork,) four hundred miles, in the course of which they were obliged to make a number of portages, till at length they found the river confined between gloomy precipices, (at least two hundred feet perpendicular,) whose banks, for the most part, were washed by this turbulent stream, which, for thirty miles, was a continual succession of falls, cascades, and rapids. From the repeated losses by the upsetting of canoes, their stock of provisions was reduced to a bare sufficiency for five days; totally ignorant of the country where they were, and unsuccessful in meeting any of the natives from whom they could hope for information.

Unable to proceed by water, Messrs. M'Kenzie, M'Clelland, and Reed, set out in different directions down the river, for the purpose of finding Indians, and buying horses. Mr. Crooks, with a few men, returned to Henry's Fork for those they had left, while Mr. Hunt remained with the main body of the men, entrapping beaver for their support. Mr. Crooks finding the distance much greater by land than he had contemplated, returned at the end of three days, and after waiting five more, expecting relief from below, the near approach of winter made them determine to deposit all superfluous articles, and proceed on foot. Accordingly, on the 10th of November, Messrs. Hunt and Crooks set out, each with eighteen men, on different sides of the river.

Mr. Hunt was fortunate in finding Indians with abundance of salmon, and some horses, but Mr. Crooks saw but few, and in general, too poor to afford his party assistance; thirty days journey brought the latter to a high range of mountains, through which the river forced a passage, and the banks being their only guide, they still, by climbing over points of rocky ridges, projecting into the stream, kept as near it as possible, till, in the evening of the 3d of December, impassable precipices of immense height, put an end to all hopes of following the margin of this water course, now no more than forty yards wide, and which ran with incredible velocity, and was withal, so foamingly tumultuous, that even had the opposite bank been fit for their purpose, all attempt at rafting was

impracticable, from the rapidity of the stream. They endeavoured to climb the mountains, still bent on pushing on, but after ascending for half a-day, they discovered, to their regret, that they were not half way to the summit, and the snow already too deep for men in their exhausted state to proceed.

Regaining the river bank, they returned, and, on the third day, met with Mr. Hunt's party, with one horse, proceeding downwards; a canoe was soon made, of a horse hide, and in it was transported some meat, which they could spare, to Mr. Crooks's starving followers, who, for the first eighteen days after leaving the place of depo-it, had subsisted on half a meal in twenty-four hours; and, in the last nine days, had eaten only one beaver, a dog, a few wild cherries, and old moccasin soles, (having travell d during these twenty-seven days, at least five hundred and fifty miles.) For the next four days, both parties continued up the river, without any other support than such rose-buds and cherries they could find; but here they fell in with some Snake Indians, from whom they got five horses, in exchange. From hence Mr. Hunt went on to a camp of Shoshonies, about ninety miles above, where, procuring a few horses and a guide, he set out across the mountains to the south west, for the main Columbia, leaving on the banks of the river, Mr. Crooks and five men, unable to travel.

Mr. Hunt lost a Canadian, named Carrier, by starvation, before he met the Shy-eye-to-ga Indians, in the Columbia plains; from whom he got a supply of provisions, and soon reached the main river, which he descended in canoes, and arrived without any farther loss, at Astoria, the principal settlement of the Fur Company in the Columbia, in the month of February.

Messrs M Kenzie, M'Clelland, and Reed, had united their parties on the Snake River Mountains, through which they travelled twenty-one days, to the Mulpot River, subsisting on an allowance by no means adequate to their toils; here they found some wild horses; and soon after reached the forks called by Captains Lewis and Clark, Koolkooske; went down

Lewis's River and the Columbia, wholly by water, without any misfortune except the upsetting of one of the canoes in a rapid, and reached Astoria early in January.

Three of the five men who remained with Mr. Crooks, fearing to perish by want, left him in February, on a small river, on the road by which Mr. Hunt had passed, in quest of Indians, and had not been heard of. Mr. Crooks had followed Mr. Hunt's track in the snow for seven days, but coming to a low prairie, he lost every appearance of a trace, and was compelled to pass the remaining part of the winter in mountains, subsisting sometimes on beaver and horse meat, and their skins, and at others, on roots. Finally, on the last of March, the only remaining Canadian being unable to proceed, was left with a lodge of Shoshonies, and Mr. Crooks, with John Day, finding the snow sufficiently diminished, undertook, from Indian information, to cross the last ridge, which they happily effected, and reached the banks of the Columbia in the middle of April: and, on the 10th of May, they arrived safe at Astoria.

On the 28th of June 1812, Mr. Robert Stuart, one of the partners of the Pacific Fur Company, with two Frenchmen, and Mr. Ramsey Crooks and Robert M'Clelland, left the Pacific Ocean for New York.

After ascending the Columbia upwards of six hundred miles, they happily met with Mr. Joseph Miller, on his way to the mouth of the Columbia; he had been considerably to the south and east, among the nations called Blackarms and Asapahays, by the latter of which he was robbed; in consequence of which, he suffered almost every privation human nature is capable of, and was in a state of starvation and almost nudity when the party met him.

They pursued their journey with fifteen horses, for the Atlantic states, without any uncommon accident, until within about two hundred miles of the Rocky Mountains, where they unfortunately met with a party of the Crow Indians, who behaved with the most unbounded insolence, and were

solely prevented from cutting off their party, by observing them well armed. They, however, pursued them on their track six days, and finally stole every horse belonging to them.

All the party were now on foot, and had a journey of two thousand miles before them, fifteen hundred of which was entirely unknown, as they intended to prosecute it considerably south of Messrs. Lewis and Clark's route ; and it was, of course, impossible to carry any quantity of provisions on their backs, in addition to their ammunition and bedding.

The danger to be apprehended from starvation was imminent. They, however, courageously pursued their route towards the Rocky Mountains, at the head waters of the Colorado, or Spanish River, and steered their course E. S.E. until they struck the head waters of the great River Plate, which they undeviatingly followed to its mouth. This river, for about two hundred miles, is navigable by barges ; from thence to the Otto Village, within forty-five miles of its entrance into the Missouri, it is a mere bed of sand, without water sufficient to float a skin canoe.

From the Otto Village to St. Louis, the party performed their voyage in a canoe, furnished them by the natives.

After they had crossed the Rocky Mountains, they fell in with a small party of Snake Indians, from whom they purchased a horse, which relieved them from any further carriage of food. They wintered on the River Plate, six hundred miles from its mouth. From the account of this party, it seems, that a journey across the continent of North America, might be performed with a waggon, there being no obstruction in the whole route that any person would call a mountain.

Art. X. *On the Genus* Crinum. *By* John Bellenden Ker, *Esq.*

Proposing to review in succession the genera which we have enumerated in the article on Amaryllis (Art. XIII. of No. IV. in the Second Volume of this Journal), as composing the second section of Jussieu's Narcissi; to avoid repetition, we shall refer throughout our reviews to that place, for the ordinal and sectional relations of all the genera. The generic and specific attributes will form alone the subject of the future articles.

The vegetable group included under Crinum consists of species of peculiar stateliness, and of a stature in proportion more generally gigantic than in any other with a tunicated bulb. We are not aware of a corolla within the genus, much below the height of half a foot when fully extended. The species are remarkable for the apparent sameness of configuration which pervades the whole of them; and it is no slender evidence of the botanical acuteness of the late Dr. Roxburgh, that he has seized and embodied in description the faint and wavering marks which distinguish essentially likenesses so near. Nor should it be forgot, that to his assiduity, while superintending the public garden at Calcutta, we owe the discovery of nearly two parts in three of those now recorded.

It has been intended by some to transfer the section of Amaryllis, with a multifarous foliage and bulbispermous capsule, to Crinum. In our opinion, this would be to complicate the character of the latter, without simplifying that of the former; and to reject the most ready technical characteristic which marks the boundary between them, for no corresponding advantage. Why should not the genera connect where they now do, as well as where they would then? A bulbispermous capsule is not peculiar to the multifarious leaved long-tubed division; it occurs in that distinguished by a bifarious foliage, and a nearly tubeless flower; and is possibly in neither a constant character.

The type of the genus, as now restricted by definition, has not been observed to range beyond the tropical or nearly tropical regions. The East Indies has the largest proportion of

species. None have been noticed at the Cape of Good Hope or the neighbouring parts, where, however, the liliaceous type is more general and diversified than in any other part of the globe. AMARYLLIS *longifolia* seems the closest transition-species in that quarter.

The colour of the flowers is confined to white and various modifications of red. The bulb is sometimes elongated cylindrically, so as to have the appearance of a stem; nearly as it is in the common leek, but on a larger scale. A characteristic we have never observed in AMARYLLIS.

GENUS.

CRINUM. *Umbella* pluri-numerosiflora, bracteis numero pedunculorum distincta, longior *spathâ* bivalvi. *Corolla* supera, erecta, tubuloso-sexfida; *tubus* strictus, pluriès longior germine, non ampliatus in faucem; *limbus* sexpartitus subæqualis, regularis, radiatus. *Filamenta* in summo tubo, uno versu inclinata v. divergentia sexfariàm, *antheræ* lineares, vibratæ. *Stylus* inclinatus, exsertus tubo, modò æqualis flori: *stigma* simplex obtusum, rariùs obsoletè trina: *germen* 3-loculare, polyspermum, ovulis in loculamento singulo biseriatis. *Capsula* membranosa, tenuis vel coriaceo-crassa, oblato-sphærica, trilocularis, sæpè loculo uno vel et altero abortivis: *semina* numerosa, horizontalia, cumulata, margini interno septi utrinque annexa, anguloso-compressa, submarginata, vel sæpiùs pauca tuberoso-laxata, vel unicum: *albumen* sicco-carnosum durum, vel sæpiùs ad instar tuberis tumifactum mollius atque succosius.

Genus transeuns in AMARYLLIDEM *ad ejusdem species longè tubulosas cum foliis multifariis, à quibus dignoscitur solà regularitate limbi rotati.* HÆMANTHO *accedit ad ejusdem* multiflorum. Bulbus *sæpè porraceus vel productus in collum concentricè foliosum caudiciforme ferè ac in* ALLIO Porro. Folia *multifaria, latè vel angustè lorata, canaliculata vel planiora.* Flores *candicantes aut variè purpurascentes; semipedales ad pedales et ultrà.*

I. *Umbellâ sessili vel subsessili.*

1. *americanum.* C. foliis striatis; umbella sessili pauci-pluriflora: tubo sulcato sublongiore limbo; laciniis lanceolatis planiusculis, undulatis; staminibus inclinatis.

Crinum americanum. *Linn. sp. pl. ed.* 2. 1. 419. *L'Heritier sert. angl.* 8. *Hort. Kew.* 1. 413. *ed.* 2. 2. 221. *Willd. sp. pl.* 2. 46. *Curtis's magaz.* 1034.

Crinum Commelini. *Redouté liliac. t.* 322; (*nec Jacquini*).

Lilio-Asphodelus americanus sempervirens minor albus. *Commel. rar.* 15. *t.* 15.

Folia lato-lorata, lanceolata. *Flores* albi: *limbo* infernè conniventi, laciniis latitudine semunciam excedentibus. *Filamenta* uno versu declinato-assurgentia, purpurea. *Stylus* purpureus, æquans stamina: *stigma* punctum simplex.

Patria: America Meridionalis.

2. *erubescens.* C. foliis lanceolato-loratis, cartilagineo-denticulatis; umbella subsessili pluriflora; tubo longiore limbo; staminibus sexfariis stylo parùm brevioribus.

Crinum erubescens. *Hort. Kew.* 1. 413. *ed.* 2. 2. 221. *Willd. sp. pl* 2. 46. *Curtis's magaz.* 1232. *Jacq. hort. schoenb.* 4. *t.* 30. *Redouté liliac.* 27.

Crinum foliis carinatis. *Miller ic.* 73. *t.* 110.

Bulbus ovatus, magnitudine pugni. *Folia* lanceolato-lorata, canaliculata supernè plana, 3-pedalia, latitudine biunciali. *Scapus* compressus, bipedalis, purpurascens. *Umbella* 6-7-flora. *Flores* odoratissimi. *Tubus* corollæ purpureo-virens, sesuncialis v. circitèr: *limbi laciniæ* 4-unciales, intùs albicans extùs longitudinalitèr secùs medium roseo-purpurascentes, lanceolato-lineares, planiusculæ, reflexo-patentes. *Filamenta* sanguineo-purpurea: *antheræ* flavæ. *Stylus* sanguineus, filamentis pauló longior.

Patria: America Meridionalis.

Obs. Vix hujus loci Crinum *erubescens: nov. gen. et spec. orb. nov. a Kunth?* Huic bulbus squamosus, folia integerrima, flores

10-pollicares, tubo 7-pollicari, laciniis $2\frac{1}{2}$ pollices longis. Species ex sicco descripta, ulteriùs in vivo recognoscenda ut sortiatur locus. Crescit propè Turbaco et los Volcanitos in humidis Regni Novi Granatensis.

3. *Commelini.* C. corollarum apicibus introrsùm uncinatis; foliis linearibus canaliculatis, scapo subquadrifloro. *Jacquin hort. schoenb.* 2. 40. *t.* 202.

Bulbus magnitudine juglandis, ovatus, fuscus, stoloniferus. *Folia* plura, sublinearia ad oras integerrima, plùs minùs pedalia, canaliculata, tereti-concava, suprà plana, apice cartilagineo obtusula, erectiuscula, 8 lineas lata. *Scapus* brevior foliis, compressus, calamum crassus, purpurascens. *Spatha* rubescens, ferè triuncialis. *Flores* sessiles, sæpiùs tres, suaveolentes, erecti, albi. *Corollæ tubus* cylindricus, a quatuor ad sex uncias longus: *laciniæ limbi* lineari-lanceolatæ, acutæ, planæ, tubo duplo breviores, ad apicem rubellæ, dorso fasciam longitudinalem mediam purpuream gerentes, primò patentes, indè reflexæ. *Filamenta* uno versù inclinata purpurea: *antheræ* flavæ. *Stylus* purpureus brevior vel longior staminibus. *Jacquin.*

Patria: America Meridionalis.

4. *defixum.* C. bulbo oblongo-globoso rhizomate fusiformi, humo altè demisso; foliis rigentèr erectis, angustè loratis, canaliculatis, longè acuminatis, margine glabro; umbella subsessili, multiflora, capsulis pedunculatis; stylo æquali staminibus.

Crinum asiaticum. *Roxburgh corom. inedit. Musæo Banks. cum tab. pict.*

Belutta-pola-taly. *Rheede hort. malab.* 11. 75. *t.* 38. *Rudb. elys.* 2. *t.* 90; *(figura Rheedii.) Synonymon aliàs minùs rectè* asiatico *datum.*

Bulbus non in collum v. caudicem porraceum productus, rhizomate stolonifero deorsùm perpendiculari-fusiformi, humi altè defixo. *Folia* multifaria, involuta, semicylindraceo-concava, ecarinata, longitudine unius vel duorum

pedum, latitudine ¾ partium unciæ v. parùm ultrà. *Scapus* sæpiùs brevior foliis, frequentiùs coloratus. *Umbella* 6—12-flora. *Flores* magni, albi, noctu odori: *tubus* cylindricus, longitudine 4—6-unciali, è parte solari coloratus, ex alterâ pallidè virens: *laciniæ* lineari-lanceolatæ, margine subundulatæ, universæ apice recurvo-appendiculatæ. *Filamenta* æqualitèr incurvo-patentia, dimidio superiori colorata: *anth.* incumbentes. *Stylus* inclinatus: *stigma* simplex. *Capsula* de germine subsessili longiùs pedunculata, membranosa, subglobosa, loculis mono-dispermis: *semina* bulbosa, rugosa *Ex angl. Roxb.*

Patria: India; in paludosis vel limosis ad fluviorum ripas.

5. *ensifolium.* C. bulbo ovato; foliis sparsis rectis uniformibus.

Nondùm floridum in horto botanico Calcutta. *Defixo* proximum, at differt formâ bulbi, foliis minùs canaliculatis, longinquiùs attenuatis, cum acumine plurimùm argutiori atque longiore. *Roxburgh corom. inedit. Musæo Banks.*

Patria: Pegu.

6. *amoenum.* C. bulbo sphærico; foliis lorato-attenuatis margine subglabro; umbella pauci-(6)-flora, sessili, laciniis lineari-lanceolatis tubo subæqualibus.

Crinum amoenum. *Roxburgh MSS. in the Library of the East India Company: cum tab. pict.*

Gocinda. *Incolis.*

Species minor elegans. *Bulbus* mediæ magnitudinis circumferentiâ 8—12-unciarum, penè globosus, neque porraceo-caudescens v. in stipitem continuatus. *Folia* 6—12, multifaria, recta, plùs minùs canaliculata præcipuè versùs basin, margine obsoletiùs scabrata, 1—2-pedalia latitudine sesquiunciali. *Scapus* lateralis, solitarius, pedalis, teres. *Umbellæ* 4—8-floræ, bracteatæ. *Flores* magni, albi, sessiles: *tubus* 3—4-uncialis, trigonus: *laciniæ* lineari-lanceolatæ, acutæ. *Filamenta* assurgenter inclinata, subæquantia limbum, purpurascentia: *anth.*

lineares. *Stylus* staminibus sublongior, incurvatus, filamentorum concolor: *stigmata* 3: *germen* oblongum, lævigatum; polyspermum.

Patria: India Orientalis; Silhet.

7. *sumatranum*. C. bulbo ovali non caudescente; foliis lato-loratis, lineari-lanceolatis, rectis, canaliculatis, margine albo-cartilagineo scabris, rigidis: umbella multiflora subsessili.

Crinum sumatranum. *Roxb. corom. ined. Museo Banksiano.*

Bulbus radiculas crassè carnosas exserens. *Folia* erecta, lato-subulata, 3—6-pedalia, 3—6-uncias lata, obversa lumini inspecta clathrato-nervosa, concava, rigentia, margine albido calloso hispido, acumine obtusiusculo. *Scapus* axillaris, brevior foliis. *Flores* magni, albi, subpedecillati, 10—20: *tubus* cylindricus, quadriuncialis; *laciniæ* limbi lineares, tubo æquales. *Filamenta* ascendentia, colorata, limbo breviora. *Stylus* brevior staminibus: *germen* tubi subisoperimetrum. *Capsula* magnitudine pugni: *semina* magna bulbosa, 2—3. *Ex angl. Roxb. vers.*

Patria: Sumatra, interioribus. Horto botanico Calcutta cultum.

8. *longifolium*. C. bulbo sphærico; foliis lorato-attenuatis, laxiùs effusis, canaliculatis, margine hispido; umbella subsessili multiflora; laciniis lineari-lanceolatis subbrevioribus tubo.

Crinum longifolium. *Roxburgh corom. inedit. Musæo Banks.*

Congeneri *defixo* præ cæteris accedens; at diversum facie, magnitudine, et formâ bulbi. Est multò majus, bulbo globoso cui rhizoma non fusiforme neque limo altè demersum. *Folia* plurima, multifariàm recumbentia, ab ipsa basi sensìm attenuata cum puncto acuto, 2—3-pedalia finibus emarcidis, concava, ecarinata, margine cartilagineo scabriusculo, striata, ubi latiora

2 uncias transversa. *Scapus* axillaris, subcompressus, longitudine varians, inundatis flores attollens extra aquam, siccis brevior foliis. *Umbella* 8—12-flora; *flores* magni, albi, fragrantes, intra 2 valvas *spathæ bracteis* filiformibus distincti. *Tubus* subcylindricus, intùs rugosus, 4-uncialis v. circitèr. *Filamenta* ascendentia, colorata, limbo fermè æqualia: *antheræ* fuscæ, incumbentes. *Stylus* æquans stamina, coloratus: *stigmata* 3, parva. *Germen* oblongum, triloculare, *ovulis* 8—16. *Capsula* diametro uni-biunciali, torosa: *semina* 1—8, magnitudine pro ratione numeri variantia.

Patria: in herbidis atque inundatis depressis Bengalæ interioris solitariò proveniens.

9. *cruentum*. C. bulbo ovato-pyramidato, stolonifero; foliis lato-subulatis, margine scabriusculo; spatha herbacea elongato-oblonga apice rotundata: laciniis plus duplo longioribus tubo.

Crinum cruentum. *nobis in Botanical Register fol.* 171; *cum icone.*

Bulbus externè livido-purpureus, sobolibus repens. *Folia* atrovirentia, coriaceo-crassa, multifaria, infrà ex collo productiùs vaginantia, recumbentia, longiora quadripedalia, 4 uncias cum dimidio lata, obsoletè scabrata. *Scapus* (nunc duo successivi) compressus vel anceps aciebus rotundatis, viridis. *Spatha* erectiuscula, foliaceo-virens, valvâ majore semipedali. *Umbella* sessilis, uno versu subinclinata, pluri-(7)-flora, *bracteis* angustis distincta. *Flores* ex tubo ad emarcescentiam usque longitudine excrescentes, ut denuò in extensum undenas uncias pedemve exæquant, stricti, subodorati, roseo-purpurei, senescentes albo-maculosi. *Germen* viride, cylindrico-oblongum, obsoletè trigonum, estriatum, exsulcum, vix tubo continuo corollæ crassius. *Tubus* strictus, in longioribus septemuncialis vel ultrà, calamum crassus, pallido-virens, tereti-trigonus, exsulcus, estriatus: *limbus* recurvo-stellatus, laciniis elongato-lanceolatis, subtriuncialibus latitudine unius tertiæ partis unciæ,

exterioribus medio dorso virentibus, interioribus sublatioribus. *Filamenta* sanguinea, unâ quartâ parte breviora limbo vel circitèr, gracilia, divaricata: *antheræ* lineares, in lunulam curvandæ, vibratæ, luteæ. *Stylus* vix filamentis crassior, æqualis flori, intensè puniceus, triquetrofiliformis: *stigma* punctum atrosanguineum parùm incrassatum.

Patria: India orientalis?

10. *angustifolium.* C. foliis margine scabris, germinibus subsessilibus, staminibus laciniis lanceolatis stylove ¼ brevioribus, filamentis antherâ 5—6-ies longioribus. *Brown prod. nov. holland.* 1. 297.

Haud aliàs notum nobis.

Patria: Nova Hollandia intra tropicum.

11. *venosum.* C. foliis — ? germinibus subsessilibus, tubo laciniis elliptico-lanceolatis venosis duplo longiore, staminibus limbi dimidio brevioribus, antheris filamenta æquantibus, stylo incluso. *Brown loc. cit.*

Non aliàs notum nobis.

Patria: Nova Hollandia intra tropicum.

12. *moluccanum.* C. bulbo sphærico, non in collum producto; spatha 4—6-flora; floribus sessilibus, declinatis, tubo recurvato æquali laciniis lanceolatis: foliis linearibus undulatis reclinatis margine scabro.

Species elegans è minoribus. An potiùs AMARYLLIDIS species?

Patria: Amboyna. Horto botanico Calcutta 1798 *allatum.* Ex angl. Roxb. *corom.* ined. in Mus. Banks.

II. *Umbellâ pedunculatâ.*

13. *asiaticum.* C. bulbo porraceo-cylindrico, toto extante; foliis lanceolatis margine lævi, longioribus scapo, umbellâ numerosa pedunculata: laçiniis angustis linearibus reflexis, vix longioribus tubo.

Crinum asiaticum. *Lin. sp. pl. ed.* 2. 1. 419. *L'Heritier sert. angl.* 8. *Hort. Kew. ed.* 2. 2. 45. *Curtis's magaz.* 1073. *Willd. sp. pl.* 2. 45. (*exclusis passim Rheede, Burman, et Miller.*)

Crinum americanum. *Redouté liliac.* 332.

Crinum toxicarium. *Roxburgh corom. inedit. Mus. Banks. cum tab. pict.*

Mun-shu-lan.—Crinum.—*Drawings of Plants done at Macao in China,* 1808, *by Wan-tchun, a Chinese painter. In the library of the E. I. Company. The Catalogue by William Kerr.*

Bulbine asiatica. *Gærtner sem.* 1. 42. *t.* 13?

Lilio-Asphodelus americanus sempervirens maximus polyanthus albus. *Commel. rar. tab.* 14. *Dillen. eltham.* 194. *t.* 161. *fig.* 195.

Lilium zeylanicum bulbiferum et umbelliferum. *Herman. lugdb.* 682. *t.* 683.

Radix toxicaria. *Rumph. amboin.* 6. 155. *t.* 69.

Bulbus magnus in collum longum caudiciforme productus. *Folia* plurima, multifariàm patentia, 3—4-pedalia latitudine 5—7-unciali, costâ mediâ crassâ, subtùs pallidiùs striata. *Scapus* lateralis, pollicem crassus. *Spatha* sphacelata, obtusa, reflexa. *Umbella* interdùm 60-flora, hemisphærica; *floribus* candidissimis, vix semipedalibus, remissè odoris; *laciniis* infernè brevè subconniventibus, indè stellatis, revolutis, involuto-canaliculatis, subtriuncialibus, æqualibus, acutulis. *Filamenta* erecto-patentia, supernè purpurea, $\frac{1}{3}$ parte breviora limbo *v.* magìs: *antheræ* obliquè incumbentes. *Stylus* gracilis, supernè rubens, æqualis vel longior staminibus: *stigma* minutum, simplex, triquetro-obtusum, obsoletè pubescens: *germen* 3-loculare, virens, oblongum, polyspermum, *pedunculo* brevi. *Capsula* parte persistente tubi præfixa, unilocularis, loculamentis 2 abortivis: vix tamen constanter?

Patria: China; in sabulosis litoreis insularum adjacentium Macao. W. Kerr MSS. in Library of the E. I. Comp.

14. ***lorifolium.*** C. bulbo cylindraceo-ovato; foliis loratis an-

gustis longissimis lentis, margine vix scabris; umbella multi-(20)-flora, pedunculata.

Crinum lorifolium. *Roxburgh corom. inedit. Museo Banksiano.*

Folia enormitèr elongata, debilia, flexa, basi ubi latiora vix duas uncias lata, in longitudinem quinquepedalem vel majorem porrigenda. *Ex angl. Roxb.*

Patria: Pegu. Horto Botanico Calcutta cultum.

15. *amabile.* C. bulbo maximo porraceo-pyramidato, extante: foliis numerosis, lato-subulatis glauciusculis, margine lævi; umbella numerosa pedunculata; tubo subbreviore limbo.

Crinum amabile. *Donn hort. cant. ed.* 6. 83. *Nobis in Curtis's magaz.* N°605. *tabb. A. et B.*

Crinum superbum. *Roxburgh corom. inedit. Mus. Banks.*

Liliacearum princeps. *Bulbus* indusiis innumeris membranaceis corticatus; in plantâ modò septenni pedalis ad sesquipedalem crassitudine cruris. *Folia* infrà vaginantia indè multifariàm divaricata, 3—6-pedalia latitudine 3—6-unciali. *Scapus* lateralis, inclinatus, brevior foliis. *Spatha* magna, acuminata, valvis reflexis; *bracteis* linearibus. *Umbella* sub-30-flora; *floribus* maximis, roseo-purpurascentibus, fragrantissimis. *Germen* coloratum ovali-oblongum, rotundatum, læve, exsulcum, *pedunculo* ipsi longiore crasso tereti-trigono. *Tubus* obsoletè trigonus saturatè coloratus, quinqueuncialis v. ultrà, rotundatè trigonus. *Limbus* revoluto-stellatus; laciniis elongato-lanceolatis, $\frac{3}{4}$ partes unciæ latis v. magis, tubo æqualibus v. sublongioribus, extùs saturatiùs coloratis, intùs roseo-albicantibus. *Filamenta* atro-purpurea, ferè duplo breviora limbo, incurvo-patentia, gracilia: *antheræ* atro-sanguineæ, unciales v. longitudine dimidii filamenti, vibratæ, versatiles. *Stylus* staminum concolor, longior, inclinatus: *stigma* parvulum subapertum, obtusum, puberulum.

Patria: *Sumatra.*

16. *bracteatum*. C. bulbo subcolumnari, foliis oblongo-lanceolatis obtusè acuminatis cum puncto cartilagineo, margine lævissimis, subundulatis; umbella multiflora pedunculata pallido-bracteosa; limbo tubo sublongiore; stylo breviore staminibus. *Nobis in Botanical Register* 3. 179. *cum tab.*

Crinum bracteatum. *Willd. sp. pl.* 2. 47. *Jacq. hort. schoenb.* 4. 7. *t.* 495.

Crinum brevifolium. *Roxburgh MSS. cum tab. in the Library of the East India Company.*

Crinum asiaticum. *Redouté liliac.* 348.

Bulbus magnus ovato-cylindraceus 4—5-uncialis, non verò porraceus vel productus in collum, radiculis crassis. *Folia* plurima, multifaria, patentia, uni-sesquipedalia, uncias 3—5 lata, utrinque striata, exteriora sæpiùs cartilagine tenui albâ integerrimâ abeunte in cuspidem callosam marginata, deorsùm brevitèr angustata atque erecta. *Scapus* octouncialis ad pedalem, valdè compressus, intùs planior, extùs convexior. *Umbella* 10—20-flora, conspicuè distincta *bracteis* pallidis lanceolatis tubum subsuperantibus. *Spatha* 3-uncialis. *Flores* magni, albi, odori, brevè pedunculati, uncias quinque in extensum superantes: *tubus* rectus, teretiusculus, obsoletè trigonus, calamum crassus; *laciniæ limbi* recurvo-stellatæ, lanceolato-lineares, subæquales, æquantes vel subexcedentes tubum, *exteriores* tertiam partem unciæ latæ, canaliculato-concavæ, *interiores* planiores angustiores. *Filamenta* regulari-divergentia, ex tertiâ parte vel magìs breviora limbo, suprà sanguineo-rubentia: *antheræ* vibrato-incumbentes, flectendæ. *Stylus* brevior staminibus, sanguineus: *stigma* punctum viride obsoletè trilobulatum: *germen* breve, oblongum.

Patria: Insula Mauritii. Horto Botanico Calcutta cultum.

17. *canaliculatum*. C. bulbo cylindraceo, parùm caudescente; foliis loratis, canaliculatis, attenuatis, margine lævi; umbella numerosiflora, longè pedunculata; laciniis linearibus obtusis, longioribus tubo.

Crinum canaliculatum. *Roxburgh MSS. in the library of the East India Company; cum. tab. pict.*

Folia 8—14, multifaria, lorata, propè finem attenuata, 3—5-pedalia, latitudine 3—4-unciali. *Scapus* axillaris, unicus, bipedalis, duplo brevior foliis, pollicem crassus *Umbella* 30—50-flora; *floribus* niveis, mediæ magnitudinis, fragrantes, *pedunculis* longis *bracteis* interstinctis. *Tubus* semicylindricus, 2 uncias cum dimidio longus; *laciniæ* canaliculatæ recurvæ. *Filamenta* inclinato-assurgentia, dimidio limbi pauló longiora, supernè colorata. *Stylus* triqueter, staminibus æqualis: *stigmata* 3, minuta, lobiformia: *germen* triloculare, *ovulis* biseriatis pluribus. *Ex anglico Roxb.*

Patria ignota. Primùm 1806 horto botanico Calcutta comparuit.

18. *pedunculatum.* C. bulbo porraceo-cylindrico; scapo centrali lato-compresso; umbella multiflora, laxa, pedunculata; limbo breviore tubo, stylo staminibus sexfariis breviore.

Crinum pedunculatum. *Brown prod. fl. nov. holl.* 1. 297. *Nobis in Botanical Register v.* 1. *fol.* 52; *cum icone.*

Crinum taitense. *Redouté liliac.* 408.

Crinum australe. *Donn cant. ed.* 6. 83.

Bulbus porraceo-caudescens, glaberrimus, diametro brachii vel triplo crassior. *Folia* plurima, multifaria, lato-lorata, lanceolata, margine lævi. *Flores* plurimi, albidi, *pedunculis* crassis germine cylindrico virente longioribus. *Tubus* 4-uncialis, cylindricus, ochroleucus: *laciniæ* firmulæ, recurvo-stellatæ, lineares, angustæ, obtusissimæ cum apiculo acuto. *Filamenta* supernè sanguinea, sexfariàm patentia: *antheræ luteæ.* *Stylus* sanguineus, non longè exsertus tubo.

Patria. Nova Hollandia, apud Portum Jackson.

19. *augustum.* C. bulbo columnari, extante; foliis multifariis lanceolatis canaliculatis margine lævi; scapo longitudine foliorum; umbella pedunculata, 20—30-flora, floribus (limbo?) declinatis.

Ex ornatissimis sectionis ordinis suæ. *Scapus* tripedalis, atropurpurascens, crassitudine carpi infantis. *Flores* roseo-rubentes, suaveolentes: *pedunculi* uni-biunciales: *tubus* dilutiùs purpurascens, 4—5-uncialis: *laciniæ limbi* lineares, semipedales: *filamenta* et *stigma* purpurea. *Ex angl. Roxb. corom. ined. Musæo Banks.* An potiùs AMARYLLIDIS congener?

Patria: Insula Mauritii.

ADDENDUM DISS. DE AMARYLLIDE; *suprà vol.* 2. *No. IV. Art. XIII.*

Amaryllis *latifolia. Vide suprà vol.* 2. *page* 369. *n.* 45.

Crinum *latifolium. Roxburgh corom. ined. in Musæo Banks.*

Diù pro varietate AMARYLLIDIS *zeylanicæ* habuimus, at inspecto bulbo differre reperimus; illo loco maximè quidèm, at aliquatenùs quoque ex aliis.

Simillima AMARYLLIDI *giganteæ. Bulbus* sphæricus circumferentiâ bipedali, basi depressior quàm apice: in *zeylanicâ* ovalis. *Folia* numerosa, multifaria, lanceolata, undulata, attenuata de propè basin in acumen latiusculum obtusiusculum, margine denticulatìm scabro, 1—3-pedalia latitudine 3—5 unciarum: in *zeylanicâ* plurimùm angustiora, costâ mediâ valdè prominentiore, bipedalia, insigniùs undulata, margine lævi. *Spatha* 10—12-flora, ovato-lanceolata, intùs multibracteata. *Flores* magni, sessiles, remissè odori: *tubus* viridis; *limbus* albus, tinctus rubore dilutissimo roseo: in *zeylanicâ* color longè intensior. *Tubus* declinatus, cylindricus, obsoletè trigonus, 4-uncialis *Limbus* campanulatus, horizontalis; laciniis lanceolatis 3—4-uncialibus, apice molli subulato. *Filamenta* subbreviora limbo: *antheræ* ex luteo cinerascentes: hæcce in *zeylanicâ* fuscæ. *Stigmata* 3. *Capsula* bulbisperma. *Ex angl. Roxb.*

Patria: Bengala.

NOTA.

Crinum urceolatum. *Flora peruviana* 3. 58. *tab.* 287. Non hujus loci. In genus novum separandum? Dignoscendum floribus dependentibus, limbo urceolato-campanulato, staminibus exsertis, capsula trigona trisulca. Fortè congener HÆMANTHUS *dubius; nov. gen. et spec. orb. nov. à Kunth?* Is certè ab HÆMANTHO depellendus; et, quantùm ex descriptione dijudicare liceat, prædicto CRINO anomalo non sine jure genericè approximandus.

ART. XI. *On a new Species of Resin from India. By* J. F. DANIELL, *Esq. F. R. S. M. R. I.*

THE resinous substance, the properties of which I shall endeavour to describe, was sent to me for examination by my friend Mr. H. B. Ker. Its history is this.—A lady brought from India a work-box that had been varnished: the varnish looked particularly clear, and had borne the heat of the climate without cracking or changing colour. Some distinguished artists saw it, and admired its peculiar beauty. The lady sent to the Rajah from whom she had originally procured it, and he remitted her an hamper full of stone bottles, containing the varnish, informing her that it was employed in all his ornamental work, and that it was used just as it was extracted from the tree from which it was procured, by incision. The name of the tree he unfortunately omitted to send. Its original consistence is that of cream, and when spread upon white paper, it dries quickly, is colourless, and of a brilliant polish, never cracking when exposed to the sun. The specimens which were sent over were put into the bottles upon being collected, and the precaution was taken of filling their necks with water. Notwithstanding this, their contents had become perfectly solid. In the state in which I received it

the resin was opake, except just at the exterior coat, which was slightly translucent, of a very pale green colour, conchoidal fracture, and of a lustre intermediate between resin and wax. It was tasteless, easily pulverized, and inodorous. It inflamed with violence, and deposited much carbonaceous matter whilst burning, and diffused a pleasant aromatic smell. Its specific gravity was 1033.

Two hundred grains of it pulverized were boiled for three hours in half a pint of distilled water: it was then allowed to stand for twelve hours. The resin, on being collected and dried, had lost in weight only 0.8 of a grain. The infusion was reduced by evaporation, and it then presented the following properties. Muriate of tin threw down a dark brown powder; solution of chlorine in water produced a yellow precipitate; and muriate of alumina, when boiled with it, became cloudy. These are the indications of extractive matter.

It was then subjected to the action of cold alcohol. Much of it was dissolved, but an insoluble white powder remained, and did not decrease in quantity by boiling.

The same white substance was left when the resin was acted upon by ether and spirits of turpentine. It was collected upon a filter well washed with alcohol, dried at a gentle heat, and then weighed 75 grains.

The alcoholic solution was colourless, and had a very peculiar smell, resembling that of the bruised stalks of green vegetables: water instantly precipitated the resin. It was evaporated at a very gentle heat, and a light yellow transparent resin remained, which weighed 127 grains. The same resin was collected from the etherial solution.

The undissolved residue was inflammable and burned with much smoke and a pleasant smell. It possessed no elasticity to the touch, but felt like powdered starch. It was not affected by any temperature under 360° of Fahrenheit's scale, when it began to fuse; and melted by a continuation of the heat into a deep-brown transparent resin. The resin which had been dissolved by alcohol began to soften at 100°, and the original resin at 220°. The specific gravity of the most fusible was 932; of the least fusible 1000.

From these experiments it appeared probable, that the peculiar good properties of this resin, as a varnish, arose from the resistance of the latter ingredient to the action of heat and chemical menstrua, and that in nature the most fusible resin was the solvent of the least fusible. I was the more anxious to find out some means of again combining the two in the fluid state, as I had little doubt but that the compound might prove an useful acquisition to the arts.

Acetic acid acted upon the resin in the same way as spirits of wine, turpentine, and ether: it dissolved one portion and left the other. Fifty grains of the natural resin and of the two separate resins were boiled in nitric acid. The action upon the most fusible was very violent. Nitrous gas was given off, and it was first converted into a deep orange-coloured substance, and then dissolved. The other two required longer digestion and a stronger acid, but were finally dissolved, after having been converted to a deep orange colour. Water added to the solutions produced a yellow precipitate, very bitter to the taste, and inflammable. Lime water produced no change, proving that no oxalic acid had been formed; but acetate of lead threw down a copious precipitate of malate of lead. It is remarkable, that the nitric solution, upon standing for some days, emitted a very strong smell of apples. It produced a slight cloud in solution of isinglass.

Solutions of the alkalies dissolved the most fusible resin copiously, the least fusible sparingly. They were precipitated by muriatic acid, and re-dissolved by excess.

Olive oil combined with the natural resin; but the compound was opake. When previously melted, it united with linseed oil, forming a drying varnish, but of a deep yellow colour. When subjected to distillation, a thick oil came over, possessing a strong empyreumatic odour. It was taken up by alcohol, from which it was again precipitated by the affusion of water. A small quantity of carbon was left in the retort.

From these experiments it appears, that the least fusible

resin approaches in its characters to copal, differing, however, from it, in being insoluble in ether.

After many fruitless trials, I at length succeeded in effecting the solution of the resins, either combined or separate, by the following process. Equal parts of camphorated spirits of wine and oil of turpentine were put into a flask, and about an eighth part of ammonia added to them. The resin was then put in, n fine powder, and the whole boiled together. The turpentine does not unite with the spirits of wine; but from the agitation of boiling, they become intimately blended, and thus mixed, they act upon the resin and dissolve it completely. The addition of ammonia to either spirits of wine or turpentine separately, is not sufficient for this purpose. Upon being allowed to stand at rest for some time, the liquid separates into two portions. The lower is transparent and brown, the upper opake; but in the course of a few days likewise becomes clear, and is nearly devoid of colour. It has a slight tinge of green, and when spread upon white paper, it quickly dries, and forms a remarkably tough and glossy varnish. Its specific gravity shews that it is chiefly composed of the spirits of wine; it retains, however, a strong smell of the turpentine.

Very little of the resin is left in solution in the lower stratum of liquid, but nearly all the camphor; and when poured upon paper, it evaporates, leaving it behind in white powder, without any stain.

The mean of three analyses of the natural resin, one made by ether, and the other two by alcohol, gives the following result:

Extractive matter soluble in water	-	0.4
Resin soluble in alcohol and ether	-	62.6
Resin insoluble in alcohol and ether	-	37.0
		100.0

There can be little doubt but that if this resin can be obtained in sufficient quantity, that it may become a very valuable acquisition to the arts.

Art. XII. *On some Combinations of Platinum. By Mr.* John Thomas Cooper. *Addressed to the Editor.*

SIR,

I beg leave to transmit to you, an account of some new combinations of platinum, which I discovered while engaged in experiments on that metal: should you conceive them of sufficient interest, you will be pleased to afford them a place in your Journal.

I have obtained an alloy of this metal, different from any hitherto recorded; it is a compound of 7 parts platinum, 16 copper, and 1 zinc. The platinum and copper are first fused with the usual precaution of covering the metals with charcoal, and adding a flux of borax. When it is in perfect fusion, it is removed from the fire, the zinc is added, and after stirring the mass, an alloy will be formed, having the colour, malleability, and nearly the ductility of alloyed gold of 16 carats fine: so striking is its resemblance to that precious metal, that it might, with equal facility, be employed for the fabrication of articles of utility and ornament, as it never becomes oxidated by exposure to air, under ordinary circumstances, nor is it acted on by nitric acid, unless at a boiling heat.

I have stated this alloy to be eminently ductile and malleable, but it is only so when absolutely free from iron. I have found the presence of $\frac{1}{2}$ a grain of iron in 4oz. of the alloy, has rendered it very brittle, and has consequently impaired both its malleability and ductility.

The pure alloy can be rolled into laminæ, as thin as gold, and I have drawn it into wire $\frac{1}{350}$ of an inch in diameter, and in either of these states it can be dissolved in nitric acid, the specific gravity of which is not less than 1.25.

It has generally been stated, that there exist two oxides of platinum, an opinion with which I am willing to coincide, but I apprehend, that the proportions of oxygen are too highly rated, and that instead of oxides, triple salts, mixed with the oxides, have been obtained.

The two oxides are stated by Chenevix, to contain 7 and 13 oxygen, combined with 100 metal, and by Berzelius, 8.287 and 16.38 oxygen with 100 platinum; but the sequel, I think, shows that the protoxide has never before been obtained in a pure state, and that it consists of 100 platinum, united with only 4.317 oxygen. Indeed, the methods used by Chenevix, must have procured him triple salts. The mode adopted by Berzelius, seems equally liable to objection. He obtained his peroxide by precipitating muriate of platinum by quicksilver; but in such cases, it is extremely difficult to prevent adulteration of mercury in the precipitate; and his method of procuring the protoxide is not less objectionable. He obtains it by exposing muriate of platinum to heat, ascertaining the quantity of chlorine given off, and estimating the quantity of oxygen that in other substances exists in the bases, united to an equal quantity of chlorine.

The protoxide may be obtained by pouring a perfectly neutral solution of mercury into a dilute solution of muriate of platinum, in hot water; a dense powder will precipitate, varying in colour from deep brown to yellow, and sometimes olive green. The powder, which is a compound of calomel and protoxide of platinum, is to be very carefully washed and dried, and then exposed to a heat, not more than sufficient to raise the calomel: that being done, there will remain an intense black powder, which is the protoxide of platinum.

In order to ascertain the proportion of oxygen in this oxide, which has always been much over-rated, I have undertaken a variety of experiments. 100 grains of the powder were heated to intense redness in a bent tube of green bottle glass, furnished with a cap and stop cock, and exhausted of common air. After giving off 12.5 cubic in. of oxygen, which were collected over mercury, the oxide was reduced to the metallic state: on examination, the metal was found to be very slightly coherent, but sufficiently so to enable me to remove it in one piece: it was now weighed, and found to have lost 4.7 grains: on examining the oxygen that had been liberated, it was found to be quite pure, as it required for its saturation, as nearly as possible, twice its volume of pure hydrogen.

100 grains of the oxide, mixed with 30 grains of pure lamp

black, were introduced into a similar tube, with stop cock, &c. which, after exhaustion, was heated as before to redness: the cock was afterwards opened under mercury, and the gas received in a graduated jar: it measured 12.8 cubic in.; and this gas, on being exposed to a solution of caustic potass, was all absorbed, except a residuum of 0.35 cubic in., which possessed all the characters of azote. It is needless to state, that the gas absorbed, was carbonic acid.

The materials in the retort, being taken out and weighed, were found to have lost 6.3 gr: 12.5 cubic in. of carbonic acid were produced, which, reduced to standard temperature, would, according to De Saussure, weigh 5.96, leaving a difference of one-third of a grain, a trifling loss, probably arising from an increased pressure of the atmosphere.

A portion of the oxide, mixed with sulphur, was exposed to heat; sulphurous acid was disengaged, but through accident, the results were not collected.

A curious property of this oxide should here be mentioned. When heated *per se*, or with combustibles, it is easily reduced, but when mixed with enamellers flux, it is capable of sustaining a very intense heat, without decomposition; indeed, it has withstood reduction in the most violent degree of heat I was able to give it. From this property, it will become an article of the greatest importance in the art of enamelling, as all blacks hitherto employed, are compounds of iron, cobalt, or manganese, which only afford a black colour, when used in body, the lighter washes appearing either purple, blue, or brown, as either of these oxides predominate. We can now, however, produce an enamel colour, which preserves an intense black in the lighter shades, and is, moreover, capable of sustaining the most violent fire, without injury, which none of the former colours will bear, without change; and hence I conceive the artist is at length in possession of one of the most important colours, which, among a few others, has long been a desideratum with enamellers. From the success I have hitherto met with, I may indulge in the hope, that my endeavours will enable me to succeed in producing, for the use of the enameller, a complete set of permanent

colours and bases, the want of which has long been felt, and has probably retarded that branch of art from reaching the eminence it is capable of attaining.

There is another very valuable colour, produced by precipitating a neutral solution of platinum, by metallic tin, which is brown, and like the foregoing, is capable of bearing any degree of heat without decomposition. The process is tedious, requiring many days before the whole of the metal is precipitated. The precipitate of platinum, by muriate of tin, may also be employed, but it is neither so bright a colour, nor so dense as that by tin alone.

The black oxide of platinum, which I conceive to be the protoxide, is not soluble in any acid, except the muriatic. By long digestion, with the assistance of heat, it dissolves in this acid without effervescence, and a dark coloured solution is obtained, similar to that produced by the action of nitro-muriatic acid on platinum; its habitudes being precisely those of that salt so obtained. It is capable of crystallizing, and its crystals present a similar aspect to those of the nitro muriatic salt, or muriate of platinum, as it is called: when heated, water, at first, is disengaged, and lastly, considerable quantities of chlorine.

From the foregoing results, we may deduce the weight of an atom of platinum. The protoxide gives off by heat 12.5 cubic in. of oxygen, which, at the temperature of 48°, weigh 4.317 gr., which accords with its loss of weight, excepting a trifling loss of one-third of a grain, which may be attributed to the accidental presence of a minute quantity of moisture: from the result, we calculate.

$$\left.\begin{array}{l} 4.317 : 95.682 \\ 4.517 : 100. \end{array}\right\} :: 1 : 22.164$$

as the equivalent expression of an atom of platinum.

By pouring a neutral solution of tartrate of soda into muriate of platinum, moderately diluted, no action takes place while cold; but if it be heated to about 180° or 200° of Fahrenheit, a decomposition ensues, an instantaneous change of colour is produced, and a blackish powder precipitates. This powder requires considerable washing, with repeated affusions of boiling water

to free it entirely from the acids; if it be now dried, it will appear of a grayish black colour. To determine its composition, it was dried on a sand bath, the temperature of which was 300°. in order to free it entirely from loose water: it was then heated in a tube similar to that employed in the former experiments, but nothing was given off except a small quantity of water too minute to be collected; its amount was estimated by heating 100 grains to redness by which it lost 2,8 grs.; no ascertainable quantity of gas was disengaged, for on opening the stop cock under mercury after the vessel had cooled, the mercury rushed in and filled the tube, with the exception of the remnant that had escaped the air pump. I made other experiments with precisely the same results; all therefore that I could obtain from this substance, was platinum and water, and I consider it as a hydrate of that metal. I have already mentioned the necessity of washing this powder with large quantities of water, and if this be not attended to, both carbonic acid and carburetted hydrogen will be obtained on heating it, from the decomposition of the tartaric acid.

If we consider the equivalent of an atom of platinum to be 22,164, we must conclude the hydrate to be composed of two atoms of platinum and one of water; should it be considered like other hydrates as constituted of one atom of platinum and one of water, then the equivalent expression of the atom of platinum must be doubled, and it will be 44,328.

It possesses the peculiar character of other hydrates: when heated, it undergoes no change until it arrives at the point of ignition, when it suddenly becomes incandescent, and its particles are seen to approximate considerably. This effect is easily shown, by heating a few grains of the hydrate upon a strip of platinum, over a spirit lamp.

I have reduced considerable quantities of this hydrate in crucibles of various kinds, and have always found it to occupy less than one-eighth of the bulk it filled before ignition, even if pressed together with considerable force: after undergoing this process, its particles are so agglutinated, as to resist separation, and when struck by the blows of a hammer, upon a hard surface, it extends considerably before it separates;

by repeated heating and hammering, it may be wrought into a solid bar. This will afford the most ready and easy method of making malleable platinum, an operation allowed to be difficult of execution. I have thus succeeded in reducing it into bars which have undergone the operation of rolling into very fine laminæ, and have also drawn it into wire $\frac{1}{350}$ of an inch in diameter.

I am at present engaged in some other experiments upon this subject, of which I shall send you the results.

Very respectfully yours,

J. T. COOPER.

76, Drury-lane,
March 16th, 1817.

Art. XII. *Botanical Extracts from a Periodical Miscellany published in Spanish at Santa Fé de Bogotá, entitled "El Semanario del Nuevo Reyno de Granada."* 1810.

From some leaves of the above work, which have been just put into our hands, we learn that the long expected history of the genus Cinchona or bark-trees has been completed and published in South America. This was an undertaking of the venerable and laborious Celestino Mutis, and of which his nephew Don Sinforoso Mutis has executed the part which remained unfinished at the decease of his uncle, in 1808. But the more interesting intelligence to the botanist, is, that the great work of the "*Flora bogotensis,*" which formed the principal occupation of the last forty-five years of the active life of the same respectable naturalist, was then (1810) fast advancing towards publication, under the charge of his nephew, the editor of the first. The species to be comprised in it, are calculated at 2000: all native within the circuit of Bogotá. The numerous plates of the figures are announced as executed in the finest manner, under the inspection of the Author. To this are to be appended the descriptions of a collection of

plants formed in the province of Quito, under the direction of Mutis himself. The care of editing the last portion is committed to Don F. Josef de Caldas, an eminent botanist in those parts. While the principal work is arranging and reducing to order in the method of Linnæus; it is proposed to publish occasionally such genera as the editors shall conceive to be new, three or four at a time, in the consecutive Numbers of the Journal now before us.

In a spot so distant and sequestered from the present focus of science, we are not surprised at the regret we find expressed for the want of the more recent works of natural history; with us in the hands of every one, they are there scarcely known by name. This deficiency must naturally abate the confidence of the editors in what relates to the novelty of that which they have to offer. In much they cannot but find themselves forestalled; especially by the works of Messrs. Humboldt and Bonpland.

We shall subjoin the six genera which appear in the leaves now before us; and are the first of the series. We place them as they follow in Linnean order. The technical generic character in Latin; the habit in English.

Monandria Monogynia.

Lozania. *Calyx* monophyllus, basi subventricosus, limbo 4-partitus laciniis ovato-acutis patentibus, persistens.

Corolla o. *Nectarium* receptaculaceum 4-angulare, fundum calycis occupans.

Filamentum unicum, parvum, obliquè sub germine insertum, a basi ad apicem sensìm attenuatum. *Anthera* didyma, ovata.

Germen ovatum. *Stigmata* tria, parva, simplicia, subcapitata, capitulo colorato.

Capsula ovata, apice acuminata, trigona, unilocularis, trivalvis. *Semina* sex (tria frequentèr abortiva) geminata, angulosa, fundo capsulæ inserta. *Sinforoso Mutis.*

Obs. Of this genus only one species has been found. A *tree; leaves* alternate, oblong, serrate, sharpened at the end. *Flowers*

spiked, *peduncles* axillary, crowded: *pedicles* from the axils of small linear *bractes.* Found in woody places in the temperate districts of New Granada. The name is in honour of Don George Thaddeus Lozano, a zoologist of eminence in those regions.

PENTANDRIA MONOGYNIA.

POMBEA. *Calyx* monophyllus, superus, 5-fidus laciniis ovatis acutis, persistens.

Corollæ petala 5, obtusa, calyce longiora, decidua.

Filamenta subulata, erecta: *antheræ* oblongæ biloculares.

Germen inferum: *stylus* cylindricus, staminibus paulò longior: *stigma* capitatum, depressum.

Capsula hemisphærica, calyce coronata, bilocularis, bivalvis: *semina* numerosa, minima, oblonga, dissepimento affixa. *Franc. Jos. de Caldas.*

OBS. An only species. A *shrub;* with alternate lanceolate quite entire smooth near-set *leaves,* and *flowers* in simple terminal nodding bunches. Native of the province of Quito. The name is a tribute of gratitude from Caldas to Don Joseph Ignatius Pombo, a munificent and patriotic patron of the sciences in the new kingdom of Granada.

ICOSANDRIA MONOGYNIA.

CONSUEGRIA. *Calyx* monophyllus, coriaceus, 3-gonus, turbinatus, limbo 4-fido plano patente, laciniis lanceolatis intùs glabris extùs tomentosis, persistens.

Filamenta filiformia (12-24) fauci calycis inserta, limbo breviora: *antheræ* subrotundæ biloculares villosæ, *polline* albo.

Germen oblongum: *stylus* filiformis basi villosus, longitudine staminum; *stigma* penicilliforme.

Capsula unilocularis, oblonga, villosa, calyce involuta: *sem* unicum oblongum. *Fran. I. de Caldas.*

OBS. Two species. Both *shrubs. Leaves* ternate, or unequally pinnate. *Flowers* in terminal racemes. In one species the angles of the calyx are prickly, in the other without prickles. In one the stamens are from 20 to 24, in the other from 14 to 16. This name is in honour of Don Sinforoso

Mutis and Consuegra. The latter appellation has been adopted; because that of Mutis had been already applied by Linnæus to a genus dedicated to his uncle Celestino. The Spaniards of distinguished families bear the paternal and maternal names connected by the particle and.

MONADELPHIA DECANDRIA.

AMARIA. *Calyx* monophyllus, tubo cylindrico, basi rotundo, ore 5-fido, laciniis linearibus apice coalitis, latere dehiscens, persistens.

Corollæ petala 5, obovata, æqualia, patentissima, calyci inserta, a basi ad apicem carinata.

Filamenta subulata, erecta, basi in tubum coalita: *antheræ* oblongæ, biloculares, incumbentes.

Germen oblongum, pedicellatum, lateralitèr calyci insertum: *stylus* cylindricus, erectus, longitudine staminum: *Stigma* capitatum.

Legumen longissimum, compressum, apice acuminatum, ad semina torosum, pedicellatum, uniloculare, bivalve, dehiscens: *semina* multa rotunda, compressa. *Sinforoso Mutis.*

OBS. Found in the temperate districts of New Granada. Two species are known. Both *shrubs*; one with cordate petioled *leaves*, the other with cordate sessile, somewhat clasping *leaves*. One with terminal, the other with axillary *flowers: peduncle* many flowered. Named after his excellency Anthony Amar y Borbon, the Viceroy, and a liberal patron of Botany, in the furtherance of which he has promoted several extensive expeditions in the interior of his government.

MONŒCIA SYNGENESIA.

CALDASIA. (*Masculini flores fœmineis commixti.*) Capitulum ovatum, scutellis 5-6-gonis, pyramidalibus, pedicellatis, coccineis, deciduis undique tectum.

Calyx proprius polyphyllus laciniis (12-16) linearibus apice dentatis erectis corollâ minoribus, persistens.

Corolla monopetala, hypocrateriformis; tubus cylindricus longitudine calycis; limbus patens 3-fidus laciniis obcordatis.

Filamentum unicum, cylindricum, tubulosum; erectum, exsertum, corollâ duplo longius: *antheræ* 3 in tubum coalitæ, oblongæ, biloculares, longitudinalitèr dehiscentes, *polline* albo.

(*Fœminei flores masculis intermixti.*)

Calyx ut in masculis.

Corolla nulla.

Germen obovatum, compresssum; *style* 2, filiformes; *stigma* obtusum.

Pericarpium nullum: *semen* unicum, minimum, obcordatum. *I. Celestino Mutis.*

Obs. A genus with the habit of Cynomorium. Four species are known; one of which is diœcious. All are leafless with the appearance of Fungi. The name is a compliment to Francis Joseph de Caldas, a celebrated botanist of Santa Fé de Bogotá; from whom a genus has been previously named by Messrs. Humboldt and Bonpland, of which a speeies is figured in the Botanical Register; so that the present becomes extinct. Amaria, Pombea, and Caldasia are said to include the most beautiful plants of New Granada.

Diœcia Pentandria.

Mas.

Valenzuelia. *Calyx* monophyllus, 5-partitus laciniis patentissimis linearibus acutis.

Corollæ petala 5, ovata, acuta, patentissima, laciniis calycis duplo longiora, et ejus fauci inserta, alterna. *Nectarium* receptaculaceum, pentagonum, coloratum.

Filamenta nectario inserta, corollâ minora; *antheræ* didymæ.

Fœmina.

Calyx ut in flore masculo, sed subtùs villosus, et persistens.

Corolla ut in flore masculo.

Germen rotundum, parvum, bisulcatum: *styli* 2 villosi, revoluti; *stigmata* obtusa.

Nux baccata, oblonga, glabra, quadrilocularis, tetrasperma. *Sinforoso Mutis.*

Obs. As yet an only species. A tree. Native of the temperate parts of New Granada. *Leaves* alternate, ovate, entire, acuminate, unequally pinnate. *Flowers* terminal in corymbose racemes; the *peduncles* and *pedicles* in the male plant villous coloured and bracteate; *bractes* linear, coloured, disposed in whorls. The racemes are sometimes hermaphrodite. Two or three of the seed always miscarry, as in Caryocar. Named after Don Lewis Valenzuela, a disciple of the elder Mutis.

We shall not stop to observe whether the above descriptions are fashioned to the latest models, whether parts which experience has proved important in the characters of vegetables, have been overlooked or too vaguely noticed in them, or not. But we hail with complacency the rays of light now gleaming upon science from the recesses of Southern America. Nor can we receive the efforts of genius newly weaned from ignorance and superstition, with the frowns of a critic. Whatever may be the deficiency in these descriptions, the learning and skill of Mr. Brown has at a glance recognized in Amaria, a congener of Bauhinia; and in Caldasia, a new genus instituted by himself to distinguish others of its congeners of the West Indies from Cymomorium, to which last the celebrated mushroom of Malta belongs. The other genera are probably new, and well founded.

We cannot refrain from noticing the honourable resolve, expressed in the short preface by Mutis and his coadjutor Caldas, on the subject of generic names; "That the laurels of science shall never be bound by their hands round the brow of the undeserving man of power, but be sacredly reserved for the patriot and the sage."

Art. XIII. *Proceedings of the Royal Society of London.*

On Thursday the 5th of December a Paper was communicated by Mr. Tod, containing an account of some experiments on the Torpedo. The author states, that when parts of the

electric organ are removed by the knife, that the animal still enjoys the power of giving shocks with the remainder; and the power of the animal over the organ continues as long as the nerves which supply it remain undivided.

A Letter was also read from Charles Hatchett, Esq. to the President, announcing that the musty flavour of injured wheat might be completely removed by infusing it in thrice its bulk of boiling water, and afterwards washing it in a sufficient quantity of cold water, and drying it in a kiln.

Thursday Dec. 12, Mr. Brande read an account of some experiments on a new species of Galls from China. They are in the form of gray vesicles, and yield 75 per cent. of tan and gallic acid; the remainder being woody fibre with a very small portion of resin. The absence of extractive matter favours the separation of pure gallic acid from these galls, and renders them peculiarly proper for black dyes, the intensity and perfection of which are interfered with by the extractive matter of other substances used in that art: they also furnish an excellent writing ink, but are ill adapted for the purposes of tanning.

Thursday Dec. 19, a Communication upon the subject of Ship-building, by M. Dupin, was read to the Society. The author proves that Mr. Seppings's plan of oblique riders is not new, but has often been resorted to by French ship-builders; and proposes an experiment, which, however, he had not made, to ascertain how far the method alluded to prevents the *hogging* or arching of the vessel. M. Dupin gives Mr. Seppings the credit of having overcome many difficulties in the application of the principle.

On Thursday January 9, the Society resumed their sittings after the Christmas vacation, and a Paper was presented by Sir H. Davy, containing a series of investigations on Flame. The reading of this communication was concluded on Thursday the 16th. The author divided his subject into four branches of discussion. The first relates to the effects of diminished atmospherical pressure upon flame, produced by the air-pump. The second on the influence of rarefaction by heat on the combustibility of gaseous mixtures. The third on the

effects produced by the addition of various gases to explosive aëriform mixtures. The fourth section contained general inferences.

Thursday Jan. 23, another Paper connected with the above subject was furnished by the same chemist.

At the same meeting a Paper was communicated by Dr. Brewster, on the Polarisation of Light.

Thursday Feb. 6, a Paper on Fulminating Platinum, by E. Davy, Esq. was read, and continued on the 13th. The author succeeded in forming a fulminating compound of platinum by the following process: *sulphuret of platinum*, prepared by passing sulphuretted hydrogene through the aqueous solution of muriate of platinum—is converted into *sulphate of platinum* by nitrous acid. To the aqueous solution of this sulphate ammonia is added in slight excess. The precipitate thus formed is boiled in a solution of caustic potash, washed and dried at 212°. It explodes when heated to about 400°, and consists of

Platinum, - -	73,5
Oxygene, - -	8,75
Ammonia and water,	17,50
	100.

Thursday Feb. 20, a Paper was communicated by J. Pond, Esq. Astronomer Royal, on the Parallax of the Fixed Stars. The commencement only of a series of investigations relating to this subject is here detailed.

Thursday Feb. 27, Sir Everard Home presented an account of some Fossil Bones of the Rhinoceros found in a mass of clay in the limestone of Plymouth. No external communication with the cavern that contained them could be discovered. The bones are particularly enumerated and described; and Mr. Brande added some comparative analyses of various fossil bones.

The same evening Mr. Thomas Knight delivered two Papers to the Royal Society; the one "On the Construction of Logarithmic Tables;" the other on "Two General Propositions in the Method of Differences;" which were not calculated for public reading.

Art. XIV. *Proceedings of the Royal Society of Edinburgh.*

January 6th. The Rev. Mr. Alison read the second part of his biographical account of the Life and Writings of the late Alexander Fraser Tytler, Lord Woodhouselee.

January 13th. The annual meeting was held for the election of office bearers. Lord Glenlee was chosen one of the Vice-Presidents in room of the late Lord Meadowbank; and Professor Jameson, Colonel Emrie, Dr. Macknight, and Professor Dunbar, councellors, in room of Walter Scott, Esq. Dr. Jamieson, Dr. Brewster, and Mr. Bryce, who went out by rotation.

January 20th. A Paper was read by Mr. Thomas Lauder Dick on the appearances called the "Parallel Roads" in Glenroy, in the parish of Kilmanivaig, Inverness-shire. Mr. Lauder Dick took an opportunity of examining Glenroy in the course of a pedestrian tour which he made to the West Highlands, along with a party of friends, last autumn. In this essay he describes with great minuteness the appearance of these "roads" or "shelves," (as he is rather disposed to call them) both when viewed at a distance and upon a close inspection. The whole extent of the Glen is about eight or nine miles, extending from north-east to south-west. It consists of six or seven distinct vistas or reaches, into which it is naturally divided by the projections and bendings of the hills which bound it. It is extremely narrow throughout its whole length, and the river Roy runs along the bottom of it. On the sloping surfaces of the hills, on the opposite sides of the valley, the appearances which have been called the "Parallel Roads" present themselves. These are a series of shelves, situated one above the other, which extend throughout the whole Glen. In most parts they are three in number; in some parts only two can be seen; but at one point no fewer than five are distinctly perceptible. From one end of the valley to the other, they preserve the same absolute and relative height, and seem to be perfectly horizontal throughout their whole length. The second road seems to be about thirty yards lower than the first or highest, and the third about sixty yards lower than the second. In number, height, and horizon-

tality, they correspond precisely with each other on the opposite sides of the valley; and this corespondence is preserved round all the bendings, projections, and hollows of the hills They are various in their depth or breadth at different parts; and are evidently much modified by the nature of the ground. Where the hill forms an acute or rounded promontory, or where it is composed of comparatively soft materials, the shelves are always deep; in a harder soil, their indentation is less; and on the surface of rock, the eye can merely trace them, and that is all. At their deeper and more distinct parts their outer edge may be observed to be considerably rounded off, while they are connected, interiorly, to the acclivity above them, by a highly sloping talus. Their surface inclines outwards in a slope of about one foot in five; and is almost every where covered with immense blocks of stone, some of them many tons in weight, lying for the most part quite detached on the surface. At the broadest part their surface did not seem to exceed twenty yards.

Mr. Lauder Dick rejects the hypothesis entertained by some, that these singular shelves are the work of man; and embraces the opinion that they have been produced by the action of the surface of a vast lake, which at some former period had filled the whole valley; but which had undergone a series of successive subsidences from the bursting out of its waters, corresponding to the number of "roads" now visible. He has even discovered a point in the Glen, through which he conceives the waters may have rushed out when the lake subsided from the level of the first to that of the second "road." He supports this theory by a number of observations made on the margins of deep Highland lakes; and also by a perfectly analogous instance of a horizontal road or shelf which surrounds a valley a little above the town of Subiaco, forty-six miles eastward from Rome; which valley is known to have been at one time filled with water. The ruins of the baths of Nero, and the remains of the mouth of the aqueduct by which Appius Claudius conveyed water into Rome, are still to be seen on this horizontal road, which now appears high up on the face of the hills bounding the valley on each side.

Mr. Lauder Dick's description is illustrated by sketches and a plan.

Jan. 27th. The following Gentlemen were elected Members of the Society.

The Right Hon. Earl of Wemyss and March.
The Right Hon. the Lord Advocate of Scotland.
Mr. Baron Clerk Rattray.
Lord Reston.
Dr. Francis Buchanan, F. R. S. and F. A. S.
Dr. David Hosack, F. R. S. Lond. F. L. S. and Professor of the Theory and Practice of Physic in the University of the State of New York.
John Wilson, Esq. Advocate.
John Fleming, Esq. late President of the Medical Board of Calcutta.
Dr. David James Hamilton Dickson.
James Skene, Esq. of Rubislaw.
Dr. William Pultney Alison.
Dr. John Howell.
Rev. Robert Morehead.
Robert Bald, Esq. Civil Engineer.
Thomas Sivright, Esq. of Meggetland.

Feb. 3d. A paper by Dr. Brewster was read containing an account of experiments made by himself and Dr. Gordon on the human eye. These experiments, which were made upon a very recent eye, related principally to the refractive power of the aqueous, vitreous, and crystalline humours, and to the polarising structure of the different parts of the organ. The aqueous and vitreous humours were found, contrary to the received opinion, to have refractive powers perceptibly greater than that of water, the refractive power of the vitreous humour being the highest. The crystalline lens exhibited a polarising structure exactly the same as quartz, or one set of doubly refracting crystals, or the same as the middle coats of the crystalline lens in fishes (see Philosophical Transactions of London for 1816, p. 311.) The iris had the very same structure, but the cornea had an opposite structure, nearly the same as that of calcareous spar, or the same as the outer and inner coats of the crystalline lens in fishes. The tint polarised by the human crystalline was a faint blue of the first order.

At the same meeting the Rev. Dr. Brewster read a paper written by Dr. Craigie on the affinity between the Persian and the Greek and Latin languages.

Sir George Mackenzie read an extract of a letter from Thomas Allan, Esq. containing a sketch of the mineralogical structure of the country round Nice. It is composed almost wholly of limestone, the strata of which are disposed in the most irregular manner. They enclose shells of the same description with those which are found in the sea beneath.

Feb. 17th. Sir George Mackenzie read the first part of an essay on the theory of association in matters of taste. He began by stating that he felt no degree of diffidence in entering on a subject of this kind with views of it considerably different from those entertained by the many eminent writers who had preceded him; and that though his observations were necessarily in a crude state, from his having had but a short time to bestow on committing his ideas to paper, he submitted them as they were, that the Society might not meet without something to discuss, and because nothing ever had been offered to its notice to fill up the vacant hour of this meeting. He therefore trusted to the indulgence of the Society.

The dissatisfaction which we have very generally expressed with all theories of taste, was attributed by Sir George Mackenzie to the circumstance of every investigator having considered only known individual emotions as they happened to be excited by the objects of his inquiry; and from his having set them up as a standard to which the feelings of the whole human race were to be referred. Much ingenuity and talent had been bestowed in the attempts to define the words Beauty and Sublimity; and apparently without success: and this Sir George believed to be owing to the general notion that these terms mean something *sui generis*, and which he considered to be an erroneous notion. He entered on the consideration of the nature of those emotions which have been attributed to beauty and its opposite; and considered them as all reducible into the two *modes*, pleasure and pain. Of these modes, he considered there were various degrees, and that Beautiful denoted a degree of the mode Pleasure, and Ugly a degree of the mode Pain: that Beautiful was to be

classed with such words as handsome, pretty, elegant, lovely, &c. each of which denoted a different degree of the same sort of pleasure; and each seemed to be as much in want of definition and as well entitled to the honour of a theory as the term Beauty.

Sir George then proceeded to point out the great extent to which the abuse of the term Beauty had been carried in ordinary language; and gave it, as his opinion, that philosophers, in appealing so frequently as they have done, to common discourse for proofs of their doctrines, had done what was unworthy of their genius. As some confusion had appeared to have arisen, on account of the want of a proper distinction between natural and artificial language, Sir George entered into a detail explanatory of what he conceived to be the proper distinction. All those gestures, modifications of the countenance, and intonations of the voice, which we use in expressing passion and feeling; joy, sorrow, respect, veneration, &c. and which are intelligible to the whole human race, and, in many cases to the lower animals, Sir George considered as, properly speaking, natural language. This, however, must be distinguished from pantomime or mimicry, which is only the *imitation* of the expression which our nature compels us to use for certain feelings and emotions.

Sir George next proceeded to consider the illustration of the theory of association, as laid down by Mr. Alison, and supported by Mr. Jeffrey, in the article Beauty, in the Supplement to the Encyclopædia Britannica, recently published. He announced his present object to be, an attempt to show that form, colour, and sound, of themselves, without any aid from imagination, and independently of any association, are capable of affecting, by exciting emotions of pleasure or of pain in every degree, those of beauty and ugliness included. He admitted, that associations often added a relish to the pleasureable, or an aggravation to the painful, emotions which external objects are capable of rousing. But as painful associations are often connected with objects that are positively beautiful, and pleasing associations with such as are positively ugly, he considered the pleasure and the pain arising from association to be quite distinct and separate from

the primary and natural effects of form, colour, and sound. This primary and simple effect, he conceived to be of itself sufficient to account for the highest as well as the lowest degree of pleasurable emotion, and for all the degrees of emotion that is painful, without any complication from the effects of association, which he placed on a footing with systems of artificial memory.

From the whole tenor of the principles of the theory of association, it was evident, as would be seen in the consideration of the illustrations, that it supposed us in possession of the power of creating and of destroying beauty whenever our humour might prompt us; a supposition which appeared, primâ facie, unphilosophical, because it embraced what was impossible. Sir George did not consider what he intended to submit to the Society as sufficient to demonstrate his general views of the subject, as this would require much longer time than he had yet had in his power to bestow on the inquiry.

Sir George now followed Mr. Alison in many of his illustrations, and turned them against the theory; and offered several new examples in opposition to the conclusions of that ingenious and eloquent writer. The illustrations this evening were confined to *form*, and were intended to show, that form, considered by itself, without association, was capable of exciting emotions of sublimity and beauty; and examples were also given to prove, that where the associations which were most obvious and natural, ought to have made us admire particular forms, they failed to produce this effect; and that there was also a failure in the opposite way. As the examples were pretty numerous, it is difficult to select any particular ones, so as to do justice to the views of the author. We shall give, however, one or two.

With respect to instruments of war, their form are said to be sublime, on account of their being associated in our minds with danger or power. The generic associations, in the general ideas of the horrors of war, of defeat, or of victory, cannot have any effect in settling our opinions of the *forms* of particular instruments; and we can only suppose that the specific purposes of each particular instrument can affect our

decision as to beauty or deformity. It was of the *form*, not the *appearance*, of such things, that Sir George meant to speak. A cannon, mounted on its carriage, is an object more admired, on account of its form, than a mortar; yet the latter, by association, should be entitled to the preference. For the cannon makes a breach in a stone wall, or in a column of men: but the mortar hurls destruction among the innocent inhabitants of a city, and sweeps all before it, sex and age being undistinguished. The sight of any instrument of war is delightful to a victorious general, but excites very different emotions in a general who has been continually beaten: but notwithstanding this opposition of associations, they both agree in thinking the form of a cannon more elegant than that of a carronade.

The association connected with trees, in order to give them a sublime effect, is said to be their expression of duration and strength. But there is no such expression in the weeping birch, which fixes its roots in the cleft of a precipice, and with which scenery of the most sublime description may be associated. Such scenery is seldom connected with the oak, which is seen in its greatest perfection in parks; yet the oak is preferred to the birch. Ships of war are very commonly associated with the oak, which may be supposed to owe to that circumstance, the admiration which its *form* inspires. But without masts, yards, and bowsprit of pine, the hull of oak could not be carried into battle. The pine is of real importance to her, and is equally entitled to the associations we usually apply to the oak; but its form derives nothing from them. That the form of the oak produces its effect without any aid from association, seems demonstrated by the fact, that out of a great many trees, all of vigorous growth, of the same age, and all equally expressive of duration and strength, one may be selected as the most worthy of admiration, and may be chosen for a picture.

There is nothing in the form of a pen calculated to excite emotions of sublimity, and no one ever thought of ascribing sublimity to such a form. Yet many obvious and impressive associations may be connected with a pen. In this instru-

ment, Bacon found the means of instructing us in the genuine method of pursuing science; and Shakespeare of rousing to their utmost pitch every emotion of which the mind is capable; yet this confers nothing on the form of a pen; nor can we consider it as a disagreeable object, because it has been used to disseminate nonsense and mischief.

March 3*d*. At this meeting, Sir George Mackenzie continued his observations on the theory of association in matters of taste. He began by considering the effects of magnitude; and, by pointing out the error that had been committed, in giving magnitude as a quality to *form*, when it was evident that form is a quality of magnitude, and that magnitude cannot alter form. With regard to the assertion, that animal forms are sublime on account of their being associated with ideas of proportionable power and strength, it was shewn, that this could not be; since, on the slightest observation, we must discover that there is no proportion between the size of animals and their strength. If the muscular power of a flea were to be increased in the ratio of size, and given to all animals, man excepted, the human species would lose all control, and be soon extinguished. No associations can induce us to admire the forms of the elephant and whale. The associations of his cowardice and cruelty, cannot divest the tiger of his beauty; nor can his bravery make us admire the form of the wolf. So far from timidity in animals depriving their forms of the power of exciting the most pleasing emotions, that very circumstance adds to the impressiveness of the form of the stag and other animals.

Sir George now pointed out and illustrated, that there was a determinate magnitude which every living creature possessed, which, when it was increased, became monstrous, and if diminished, it was dwarfish and contemptible; that there was a determinate magnitude to which every inanimate object must reach, in order to be capable of rousing emotions of sublimity, in the first instance; and that there was also a determinate magnitude which was *most* sublime. He showed that the assertion, that magnitude in height expressed mag-

nanimity, was erroneous, since it could only have been derived from poetical comparison, which was not association any more than metaphor. Sir George had no objection to a magnanimous person being compared to a church steeple, but because such a comparison had been made, he could not feel that a church steeple expressed magnanimity. Magnitude in length could not, as had been said, express vastness, because this last term implied other dimensions as well as length; and the illustrations used by Mr. Alison, of a *plain* and the *ocean*, were inapplicable from this circumstance. Magnitude in breadth is said to express stability. We know that there is a law which governs matter, by which we are instructed to give a broad base to whatever we wish to stand firm. But such knowledge is no more the result of association, than natural language, or any thing which nature has taught us. Magnitude in depth is said to express terror; and Mr. Alison appeals to the popular notion of hell being a deep abyss. But we do not think of hell, when we stand upon a high rock, and look down upon a rich valley beneath us; and here there is magnitude of depth. Sir George took an opportunity to impress on the Society, that *fear* has no share in the emotions called sublime. Sublimity is lost when fear takes possession of us, and when fear departs, sublimity is restored. He spoke of his own emotions when he visited the Icelandic Geyser, which may be considered as a cauldron connected with hell by association. The true emotion of sublimity prompted him to explore every thing about this wonderful fountain; but had fear operated, he would have kept at a distance. He observed, that it was perhaps erroneous to speak of magnitude as a quality of height, depth, breadth, and length; because all these together composed magnitude, and it appeared improper to speak of the *whole* of a thing as a quality of a *part* of the *same* thing.

Sir George endeavoured to show, that description ought not to be appealed to for proof in any case where taste is concerned; because just notions of *form* can only be acquired by sight or touch. The experience of every one who visits a

country of which he had previously read a description, demonstrates that the real scenery is quite new to him when he beholds it; and it is the same with every thing.

That *curvilinear* forms derive their beauty solely from their expression of tenderness and delicacy, was contradicted by an appeal to a snake, in which, besides the absence of these qualities, associations occurred of a very disagreeable kind; yet the curves of a snake were universally esteemed beautiful. The example, also, of a ship under sail, which is a form universally admired, was produced to show the presence of curvilinear forms without tenderness and delicacy; also, the example of the outline of a mountain scene; a winding path up a hill; and the forms of bridges.

Mr. Alison acknowledges, and endeavours to prove, that trees are sublime, from their expression of duration and strength; and he deprives them of beauty because they express the same thing, the absence of delicacy and tenderness. The very circumstance of the twisting and curving of the branches, is generally considered as the cause of our admiring trees, and some more than others, on account of their having such forms. In this instance, Mr. Alison distinctly separates beauty and sublimity; and it is somewhat singular, that his able and distinguished supporter, Mr. Jeffrey, should clearly show, that one of the consequences of Mr. Alison's theory is, the identification of sublimity, beauty, and the picturesque.

With respect to imitations, Mr. Alison asserts, that they may be so perfect as to deceive us into a belief that they are real: but that whenever we are told that an object we admire is an imitation, in iron or any other metal, the beauty instantly vanishes before the conviction of the force and labour employed in producing the imitation. Sir George Mackenzie stated, that from this, it followed, that imitations must recede from, or approach to, beauty, in proportion to the rigidity of the material employed, which was impossible. On such principles, it appeared necessary, that the beauty of a statue should vanish before the conviction of the long time and labour employed on the hard material of marble. It is quite inconsistent to refuse excellence of workmanship, which is

the apology for Mr. Alison's admiring a statue, any effect in the imitation of other things in hard materials, which, he says, are such as to deceive us into a belief of reality, which a statue can never impress. Mr. Alison also asserts, that a bar of iron, twisted into the most perfect spiral form, is beautiful, but that the conviction of the force and labour employed, destroys the beauty of the form. Yet, he says, that this same bar of iron reduced, by a far greater amount of force and labour, to the state of fine wire, restores beauty. But according to his own principles, the more delicate the wire, the more should the expression of delicacy be obliterated, by the conviction of the increasing force and labour employed.

March 17*th*. Sir George Mackenzie continued his observations on the theory of association. He stated that after this evening, he would not occupy the attention of the Society any longer, during the present session, with the subject of taste; and that he hoped to submit his ideas in a better shape than that in which he had offered them; and also what he proposed to substitute for the existing theories of taste, to the deliberate attention of philosophers, at some future time. He then proceeded to offer some remarks on architectural objects, with the view to show that forms of this kind produce their full effect on the mind at once, without a moment being allowed for reflection, or for commencing any train of thought in search of associations. No one, he observed, ever thought of ascribing beauty to the exterior of a building which was plain and irregular, and without any particular arrangement, although the interior might be exceedingly commodious, and richly furnished: nor of ascribing ugliness to the elevation of a Grecian structure, the interior of which presented neither convenience nor splendid decoration. It would be absurd to say that on entering a city we were not at liberty to admire the elevations of the houses, without troubling the inhabitants with unseasonable visits, in order to show our devotion to the minute associations, which were supposed to be necessary to constitute beauty. He appealed to the individuals who first invented any style of architecture, and challenged the advocates of association to show that this individual, when he invented what we so much admire, constructed the forms out of

any impulse but that of his own innate faculties. He felt certain proportions and dimensions to be better calculated to excite emotions of pleasure than all others: to him they were irresistible, and he reduced them to practice; and to us any alteration gives offence from the same cause, not from any fanciful associations.

The beauty of the human countenance had been attributed to the expressions of youth and health; of innocence, gaiety, sensibility, intelligence, delicacy, and vivacity. To this Sir George replied, that this implied as much as if we could not tell whether a woman was young and healthy, unless her face was beautiful; which is absurd. He said it was presumptuous to appropriate all these qualities exclusively to beautiful women, when we know that they were all in equal possession of homely females. Vice, according to the principles of the theory, ought to *destroy* female beauty, in the same manner as the idea of force and labour was said to destroy the beauty of an imitation of any thing. But vice, the most disagreeable association that could be attached to a female, never altered our opinion of beauty. The goddess of beauty herself is described as a strumpet and adulteress; yet we look upon her statue, said Sir George, as a model of perfection in the female form. Pretty idiots, he observed, were more common than ugly ones; and female geniuses have been known, whose faces no man could consider beautiful. Such associations as those to which, it had been said, that the female countenance owed its beauty, were therefore impossible, or at best fanciful; unless beautiful women were the patentees of youth, health, innocence, &c.

It would be difficult to give any distinct account of what Sir George said on the subject of colour; especially as he mentioned that he had been obliged to abridge and disarrange his remarks, in order that he might have time to say a few words also on sound. It is scarcely fair, therefore, to say any thing of this part of the essay. There is one part of it, however, which may be noticed. Sir George stated, that it is contrary to the true principles of reasoning, to explain the taste of one person, by means of any peculiarity in the taste of another, or the want of it. There were individuals,

and nations, so fond of mere colour, that, without attending to any particular arrangement, they decorated themselves, their houses, every thing around them, with glowing colours. There were others who had the power of discerning harmony in colours; but it was illegitimate to argue that, because one man daubs every thing about him with bright colours, there was no such thing as harmony of colour; which has been done, however, by the writer in the Encyclopædia. On the same principles it might be said, that there was no enjoyment in moderate eating or drinking, *because* there were gluttons and drunkards. Pink was not beautiful, *because* it was the colour of a rose, or the cheeks of a *young* woman. There are white roses, yellow roses, and some red and white, and red and yellow. Therefore there is no necessary connection between pink and a rose. There is *youth* in a Morisco woman, and a negress; why, in their cheeks, is not olive and black beautiful? as the beauty of the female countenance is not necessarily connected with innocence; hence a pink cheek, a part of that beauty, is not necessarily typical of purity of mind. Sir George had heard of a certain configuration of a red nose, called a *strawberry* nose; but on that account he could never consider the nose as beautiful, nor had he been cured of his predilection for strawberries by this filthy association. If green be beautiful because it is the colour of grass, grass must have some quality which renders its colour pleasing; and the same quality must be shown to belong to the emerald and to the feathers of a parrot, which is impossible.

The same apology must be made for our imperfect account of what Sir George said with regard to sound. That there was something in simple sound which affected us agreeably or disagreeably, without the help of association, Sir George illustrated by the fact, that we do not choose musical instruments without trying the quality of their sound. A bell must have a fine ring; a piano-forte a fine tone; an organ a good voice; otherwise we reject them. Any piece of cat-gut will produce a given note when put upon a violin; but a performer is very nice in his choice of strings. Agreeable sounds are not necessarily connected with agreeable associations; and

disagreeable sounds often remind us of what is pleasing. The same bell announces good news, and that a friend is on his way to the grave. Sir George mentioned that he had always been very fond of the sound of thunder, and that he still enjoyed it as much and even more than ever, though he had been in great danger from lightning.

Music, Sir George observed, is addressed to our *feelings*, in most cases: and hence every piece of music is not universally admired; for some have different feelings from others, and one feeling stronger than another. But music can please without being so addressed. Sir George mentioned the case of one of his children who had shewn a very early disposition for music. This child takes likings to particular tunes, and always asks for his favourites. It is impossible that at an age between three and four years, a child can form associations. Sir George was convinced, however, that there is some character in particular pieces of music which harmonize with the child's natural dispositions. Sir George concluded, by observing that, though he would not at present attempt to demonstrate it, he was convinced that the connection which seemed to subsist between music and our natural dispositions, originated in the law of our nature, which appropriates certain intonations of voice to the expression of certain feelings. It was a splendid instance of the power and of the beneficence of the Creator, his having enabled us, out of seven simple sounds, with the aid of time, to range our enjoyment to an extent infinite and inconceivable.

Art. XV. *Proceedings of the Academy of Sciences of the Royal Institute of France.*

Sept. 16th. Our former account of this meeting was incomplete, in consequence of the hurry of our correspondent to send it off for publication. The following works were presented to the Academy:

Philosophical Transactions for 1816. *Part I.*

A Treatise on the Economy of Fuel. By Robertson Buchanan, *Esq.* Glasgow, 1 vol. 8vo.

Traduction complete de l'Almageste de Ptolomée, par l'Abbé Halma. M. Delambre was charged to give an account of this work to the class.

Voyage de Découvertes aux Terres Australes, Historique, 2me Partie, par M. Freycinet. 1 vol. 4to. Atlas.

Programme des Prix de l'Academie de Dijon.

The Secretary Delambre read a report on a memoir of Mons. Caddel, "On the Lines which divide each Semidiurnal Arc into Six Equal Parts."

Baron Larrey read a memoir, "*Sur les Effets des Balles perdues dans la Cavité du Thorax,*" as a continuation of his researches relative to the operation for empyema. MM. Pelletan and Deschamps were appointed commissioners for an account of this paper.

M. Chambon read a memoir, "*Sur le Système des Agriculteurs qui forment plusieurs Essaims avec les Abeilles d'une seule Ruche.*" MM. Bose and Latreille appointed to examine it.

MM. Hauy and Ampère were named for the purpose of examining a memoir of Mons. Opoix, of which the title alone was read by the secretary, being "*L'Ame dans la veille et dans le Sommeil.*" Adjourned.

Sept. 22d. Messrs. Gay Lussac and Arago took their seats, on their return from England.

The last volume of the *Mémoires de l'Academie de Petersbourg* was presented, and a letter read, accompanying a bottle of indelible ink, from Mons. Aymez. M. Thenard was named one of the commissioners to examine the latter.

Professor Hallé read a report on the memoir of Mons. Majendie, already alluded to in the Journal of Science, respecting nutrition and the presence of azote in animals. The reporter, who seems to favour Mons. Majendie, doubts the veracity of certain writers, who assert, that there have been persons who have lived on substances not containing azote, such as sugar, oil, gum, &c. He particularly questions the instance, generally quoted, of the *caravan;* as it is probable, according to

his opinion, that travellers, who are said to have lived on gum only in crossing the deserts, drank camels milk at the same time! Mons. Lamark very properly observed, that the experiments, in order to be conclusive, ought to have been repeated on *herbivorous* as well as carnivorous animals, that some opinion might be formed of the relative effects produced on them and man. From the report, it appears, that with a view of ascertaining the effects produced on the digestive system by substances deprived of azote, M. Majendie examined both the chyme and chyle of the dogs on which the experiments had been made, and found the former to be of a very peculiar nature, while the latter presented some difference in its characters, according as it had been produced by oil or butter; that of the former is milky, while that, which is derived from the latter, and the use of gum, is more fluid and watery, and of a fine opaline colour. The report concludes with some favourable resolutions, which, after having been slightly opposed by some members present, were adopted by the Academy.

Mons. Dupuytren was called upon to read a memoir, for which his name had been inscribed; but not being present, and there being no other papers before the Academy, the President proceeded to remind the different members charged with making reports on memoirs read before the Institute, that more than the necessary time had elapsed for that purpose, and recommended that they might be made as soon as possible. Adjourned.

Sept. 29th. The minutes of the preceding meeting were read and approved. No correspondence. The following works were presented:

1. *Proceedings of the Board of Agriculture at Chalons.*
2. *Proceedings of the Academy of Sciences at Marseilles.*
3. *Notice sur l'Epizootie du gros Bétail, observed at the Veterinary School of Alfort.*
4. *Mémoire sur l'Inoculation du Claveau faite à l'Ecole d'Alfort.*
5. *Confutation de quelques Erreurs de Strabon.*
6. *Sur la Fabrication des Vins, &c. par* Julien.
7. *Traité des Maladies nerveuses, 2 vol. par* Villermay.

Mons. Jonnés distributed one hundred copies of his memoir on the *Géophages*, and of another on the Introduction of the yellow fever in the Antilles.

Several vacancies are announced to have occurred amongst the corresponding members of the Academy, in the section of Astronomy.

Mons. Cuvier read a memoir on the *Cephalopodes*, with a detailed account of their anatomical structure. The author observed, that the anatomy of these animals has been neglected by the naturalists, who entertained incorrect notions respecting it, till Monro exposed some of their errors, without, however, being himself completely correct. This circumstance induced Mons. Cuvier to undertake the subject of his present memoir. On speaking of the ink of the sæpia, the writer strongly opposes Monro's opinion of its being the bile of those animals. The construction of their eyes, hitherto unknown, has been ascertained by Mons. Cuvier to be equally beautiful and nearly as complicated as that of the most perfect vertebrated animals. It has, however, some singular peculiarities, which distinguish them from those of the latter—the non-existence of the anterior chamber, and the immobility of the pupil, which is formed by the external tunic. No choroid membrane is to be found in this organ. The clear manner and minute exactitude of details which so eminently distinguish this naturalist, seemed to prevail throughout this interesting paper, which, as we are informed, is only the first of a series to be read on the same subject. Many important facts, particularly on the nervous arrangement of the sæpia, and the physiology of their functions, are to be found throughout this memoir, which terminates with an observation of the author, that the complete anatomical knowledge of the *cephalopodes* he has thus acquired for the first time, induces him to consider these animals as beings completely insulated, and consequently as having been erroneously classed in some of the late systems of animal *genealogy*, where they are made to form one of the links of the great chain of animal beings. "No deviation in the ordinary form of this animal," says M. Cuvier, "has ever produced or can constitute a being placed

beneath it; nor can or ever will its better development give rise to a series of animals of a more perfect species to be classed immediately above it."

In the course of the meeting Mons. Bonpland presented the eighth livraison of the Rare Plants cultivated at Malmaison; and Mons. Boyer sent some notes on certain diseases, which being of a nature not to admit of being publicly read, were referred to Messrs. Pelletan and Deschamps for a report.

Mons. Brongniart read a report on a memoir of Mons. Marcel de Serres, on a new Geognostic Situation of a Calcareous Rock of fresh water Formation near Montpellier. This limestone is found on the banks of the Vidouvle, extending from Sommiére to beyond the village of Salinelle. It constitutes the hill of Montredon, rising to nearly 150 metres above the level of the river. This hill is composed of two distinct calcareous rocks—the superior is more soft and porous than the inferior; the latter is siliceous and compact, without any evident traces of stratification. It is in this situation that the *magnesite* of Salinelle, better known under the name of *pierre à décrasser*, is found, and which Mons. de Serres is inclined to consider as belonging to the fresh water formation he describes. He gives the enumeration of the shells found in these two rocks, some of which seem to be new, or at least little known. Adjourned.

Sitting of the 7th of October. The minutes being read and approved, one of the Secretaries laid before the Academy the following works from their different authors:

The Triumph of Constancy, a poem, in six cantos, by Miss Porden, who was present at the meeting.

Traité élémentaire du Calcul des Probabilités, by Mons. Lacroix.

Note sur le Magnetisme Animal, &c. par le Docteur Montégre.

Mémoire sur la Capillarité, par M. Sarthou. MM. Arago and Ampère were named commissaries to report on this work.

Journal of Science and the Arts, edited at the Royal Institution of Great Britain. No. III.

Journal de Pharmacie et des Sciences accessoires, for September.

Observations sur divers Fossiles de Quadrupèdes vivipares nouvellement découverts dans le Sol des Environs de Montpellier, par

M. Marcel de Serres. The Academy named MM. Cuvier and Brongniart to examine and make a report on this paper.

Mémoire sur l'Influence de la Polarization dans l'Action que les Rayons lumineux exercent les uns sur les autres, par M. Fresnel. MM. Arago and Ampère were directed to give an account of this memoir.

Mons. Delambre, one of the Secretaries, read a report on the second and last volume of a translation of Ptolemy's Astronomy, by M. Halma. Some remarks on certain passages of the report were made by Count Laplace, in which he endeavoured to support Ptolemy's astronomical reputation, particularly as an observer. To these remarks an eloquent, profound, and perfectly satisfactory answer was made by the reporter, who asserted it to be his firm persuasion, that Ptolemy could never have observed on any of the occasions on which he pretends to have done it, and that all his results were the mere offspring of incorrect calculation.

M. Dupetit Thouars read a memoir on the *Nomenclature of Plants.* MM. Desfontaines and Mirbel were named commissaries.

A short abstract of a memoir of Mons. Hachette, *Sur la Théorie des Lignes et des Surfaces courbes,* which was referred for examination to MM. Legendre and Arago, was next read.

The Academy resolved itself into a secret committee, for the discussion respecting the candidates proposed for the three vacant places of corresponding members in the section of astronomy.

Oct. 14*th*. After the reading of the minutes of the preceding meeting, a letter from Signor Vassalli-Eandi, Secretary to the Royal Academy of Turin, was read, in which he mentions having forwarded the seventeenth volume of the Transactions of the Societa Italiana, *Parte Fisica.*

The Bibliothèque Universelle for July, published at Geneva. was presented; also the following works:

Histoire des Polypiers corraligènes fléxibles, vulgairement nommés Zoophites, par M. Lamouroux. 1 vol. 8vo.

Monographie de Trigonocephale, par M. Moreau de Jonnés.

Nouvelle Nomenclature chimique d'après Thenard, par Caventon. M. Vauquelin is charged to examine this work.

Il buon Governo dei Bachi da Seta. Dal Conte Dandolo. 1 vol. 8vo. 1816.

Transactions of the Linnæan Society, 1816. Part I.

Mons Gay Lussac read an extract of a letter from M. Robiquet, announcing, that a woman had found at Tressignan, department des Côtes du Nord, in a ditch, a mineral substance, which she offered in vain for sale to several persons; but for which a silversmith gave her 900 francs, having ascertained it to be native gold, of $\frac{800}{1000}$ standard. M. Robiqnet sent a small specimen of the original mass to the Academy. The metal was implanted on a gangue of quartz, and of a considerable size; and it is to be regretted, that the Prefect did not make the acquisition of it, in order that it might have served as a guide for further researches.

MM. Deyeux and Thenard read a report on the memoir of M. Guichardiére, respecting the possibility of manufacturing excellent hats with the fur of the common otter. (See our last Number.)

The same gentlemen read a report on the indelible ink of Mons. Aymez, and expressed their opinion, that the ink in question did not possess the property attributed to it by the manufacturer.

A third memoir on Distilled Water by M. Lunel did not receive the approbation of the persons charged to examine it.

MM. Coquebert Montbret de Rossel and Brongniart present a report on a Map of the Island of Martinique, drawn up by Mons. Moreau de Jonnés, who used for basis of his work a map published about fifty years ago, by Moreau du Temple. The mineralogical constitution of the French possessions in the Antilles, the commissaries think, has not hitherto been well known. Mons. de Jonnés ascertained that all the mountains in the island are of volcanic origin: he found six extinct craters, and determined the limits of the eruptions. There is no granite in the country, as some travellers have before asserted; but much calcareous stone containing fossil remains. here are, however, several additions to be made yet to this

map, such as barometrical elevations—sections of strata—a more particular account of the fossil remains—and an accurate examination whether the calcareous stone rests or not on volcanic rocks. M. Jonnés announces a collection of minerals, and promises a detailed work on the island. The commissioners take this opportunity of suggesting, that military and geological maps should be so constructed, as to be of mutual service to each other. The report concludes with an approbation of the map in question.

MM. Desfontaines and Mirbel read a report on a proposal of M. Cassini, junior, for establishing a new family of plants, called Boopideæ, which the commissaries adopt.

MM. Poisson, Ampère, and Cauchy read a report on a memoir of Mons. Hachette, relative to the *Ecoulement de Liquides, &c.*

The Academy proceeds to the election of three corresponding members in the section of astronomy, amongst the following candidates:

Mr. Pond, at Greenwich.
M. Bessel, at Koënisbergh.
Mr. Mudge, at Woolwich.
M. De Lindenau, at Gotha.
M. Bohrenberger, at Stuttgard.
M. Carlini, at Milan.

At the first scrutiny Mr. Pond had 34 votes; Mons. Bessel 33 on the second scrutiny; and on the third Colonel Mudge had 30 votes—the total of voting members present being 37. MM. Pond, Mudge, and Bessel were therefore duly elected corresponding members of the Academy.

Oct. 21. The Academy receives the following works:

Transactions of the Geological Society of London, Vol. III. with plates.

Tableaux chimiques du Règne animal, par M. F. John, translated from the German of M. Robinet, 1 vol. 4to.

Première et deuxième Leçons expérimentales d'Optique, sur la Lumière et les Couleurs, par M. Bourgeois.

M. Chevessaille proposes two new fire escapes. MM. Girard and Cauchy commissaries.

M. Pelletan read a report on a memoir of Mons. Elleviou, in which the author proposes to substitute the simple perforation of the cranium to the operation of trepanning, in cases where the latter is necessary. He says that a small and a simple hole, while it would be sufficient to give issue to the pus or any other secretion lodged between the bones and the dura mater, would also present the advantage of defending the latter membrane from the contact of external air, which seldom fails to produce very alarming symptoms, particularly in hospitals. M. Pelletan, however, objects to the smallness of the aperture, contending that the pressure of the external air would in that case more than counterbalance the pulsating elevation of the brain, and consequently impede the flow of extravasated pus or blood. He likewise asserted, that in no case whatever has the action of the external air on the dura meter after the use of the trepan, been productive of bad consequences. The author, therefore, says the reporter, is in error, both as to the proposition of perforating instead of trepanning the cranium, and with regard to the possibility of evacuating the extravasated pus lodged between the bones and the membranes. In the first case, the author's anatomical knowledge seems to be defective; and in the second, he appears ignorant of the common laws of mechanic philosophy. Indeed the author has been particularly unlucky in the selection of examples: one of which is—that if a case occur, where the exact place of the accumulated fluid is not known, the operator should perforate the cranium here and there, till he hits on the right spot! The author allows, however, that in cases where it is necessary to elevate depressed bones, nothing can supply the trephine. The reporter concludes with proposing, that the memoir should be considered as never having been read (*comme non avenu*).

The same professional gentleman read another report on the memoir announced in our last Number but one (when the author's name was by mistake spelt Lavenu instead of Larrey), being a continuation of the one printed in his *Recueil*, on the Operation for Empyema. The Academy, on the pro-

posal of the commissaries, decrees that the memoir shall be printed among the memoirs of the *Savans Etrangers.*

M. Cuvier read a memoir on the Conformation and the Anatomy of the Hottentot Venus, who died at Paris last year, of a disease which the attending physicians could not well determine. M. Cuvier has dissected the subject, and presented the skeleton to the Academy. He intends shortly to publish his memoir in the "Annales du Musée d'Historique Naturelle."

M. Berthollet presents a report on a recent memoir of M. Dulong, on the Combinations of Phosphorus with Oxygene (see page 163 of Number III.). The reporter concludes with these words: "We find in the present memoir that sagacity which distinguishes the other researches of M. Dulong—a profound knowledge of chemical analysis, and results which had escaped the attention even of the most able chemists." The Academy resolves that the memoir shall be printed in the volume of the *Savans Etrangers.*

A memoir of Count Berthollet was next read, giving a Historical Sketch of the Rise and Progress of the Atomic Theory. In this paper the author has enumerated, in a concise but clear manner, the opinions and the experiments of Dalton, Thomson, Davy, Berzelius, Wollaston, Gay Lussac, and others, on the definite proportions observed in chemical compounds. After mentioning the difference which exists between Dalton's original theory and the development which Thomson gave to it, consisting chiefly in ascribing a different weight to the atoms, and in supposing a different number of atoms in the same compound, Count Berthollet proceeds to shew the distinction between Dalton's and Berzelius's system. The former considers the atoms simply as to their relative weight, while the latter determines them by their volume. The difference between these two methods does not produce any real difference in regard to the theory of combinations—but necessarily gives rise to a very great one in the indication and the comparison of the proportions with which the combinations are formed. Thus Berzelius considers water to be a

compound of 1 volume of ox. + 2 vol. hy.; whereas Dalton and Thomson give it as a compound of 1 atom o. + 1 atom hyd. It is, therefore, a binary compound, according to the latter; and a ternary one, if we adopt Berzelius's theory. The consequence will be, that the number representing the same compound in the two theories can no longer agree. M. Berthollet next explained the formulæ employed by Berzelius, to represent the different compounds; taking it for granted, that all gaseous bodies combine with each other in equal volumes, or as 1 : 2, 3, 4, &c. and gave the method used by the same chemist, for ascertaining the weight of the volume of the substance entering into the combination.

Sir H. Davy's method is next analyzed, and his manner of establishing and calculating the proportions of the bodies forming the combination, is clearly detailed. The general law of multiples in such cases, established by Berzelius, is not admitted by the English chemist, who proved that azote, for instance, follows certain particular laws in its combinations with other substances.

The first practical application that has been made of Dalton's atomic theory, is due to Drs. Thomson and Wollaston The former found, that the neutral oxalates become immediately bi-oxalates, by taking up a double quantity of acid, without forming any intermediate combination: while the latter proved, that carbonate of potash contains precisely double the quantity of acid which serves to form the sub-carbonate. Analogous observations have been multiplied, since that, by different chemists.

In tracing this historical sketch of the atomic theory, Berthollet pays a just tribute of praise to Proust, for his researches on the various oxides—as well as to Rouelle, for his distinction of *acid* and *sub-acid* salts, and to Richter, for his tables of the constant proportions found in neutral salts—tables, which have suggested the very ingenious and much more extensive synoptic scale of Dr. Wollaston.

Another of Richter's observations, namely: that metals, treated with an acid, produce a saturation equal to the quantity of oxygene in the oxide forming the combination—had

been neglected until Gay Lussac shewed, that oxides, producing the same degree of saturation, contain the same quantity of oxygene. We owe to the latter eminent chemist, the discovery of another important and constant principle, viz. the combination of gazeous bodies in simple proportions or volumes; and the simple relation between the apparent contraction of the volume, and the real volume of the gas itself.

After thus enumerating the different researches of the various chemists who studied the principles and laws of the atomic theory, by which science has been enriched with so many brilliant results, Count Berthollet asks to what cause ought we to ascribe the obscurity which still pervades this part of chemical science, and the difficulty which seems attached to it? This problem is of a comparatively easy solution. The difference in the numerical expression of the same atom or combination of atoms—the attempt at generalizing a law hitherto supported only by experiments made on a comparatively small number of substances—and lastly, the opinions of several philosophers, so much at variance with each other on the same subject; explain sufficiently why, with so many facts before us, we are at a loss how to form a code of indisputable laws on the theory of atomic combinations. Adjourned.

Oct. 28th. The Number of the *Annales de Chimie*, for August, was presented by the Editor to the Academy.

A letter from the Minister of the Interior was read, in which he informs the Academy, that Mons. Freycinet had been appointed to the command of one of His Majesty's vessels, for a voyage of discovery to the South hemisphere, and requests them to name a commission for drawing up the necessary instructions for such a voyage. The king having approved the measure, the vessel has been named, and is now ready to sail. The correspondence between the Minister of the Marine and Freycinet, on this occasion, was next read; when the Academy proceeded to name the commissioners for drawing up the demanded instructions. They are Messrs. Delamarck, Cuvier, Lacepede, Humboldt, Gay Lussac, Desfontaines, Von Buch, Biot, and Arago; the two latter, and

Delambre, being appointed by the Board of Longitude for the same purpose.

M. Desfontaines next read a report on a note of Mons. Virey, respecting the real nature of the *ergot* of rye, which he asserts to be a disease of the grain, and not a parasitic plant, as mentioned by Decandolle. Mons. Desfontaines, after giving the description of the ergot, enters into some elaborate researches respecting its growth, real nature, and external character, detailing, at the same time, the experiments made by Mons. Vauquelin, upon that substance. The reporter likewise details the opinion announced sometime ago, by Mons. Decandolle, that the ergot was a champignon, to which he had given the name of *sclerotium*, and that the seed of this parasitic plant was absorbed by the rye, and germinated afterwards. But facts, the reporter might have added, are not in support of this theory, and experience as well as experiments, prove the contrary to be the case. The report concludes with saying, " that although we do not reject altogether Mons. Decandolle's opinion, the experiments, and every other circumstance, must naturally induce us to adopt M. Virey's way of thinking on the subject." To the differences existing between the *ergot* and the *sclerotium*, mentioned by Mons. Desfontaines, M. P. Beauvois added, from his own observation, that there is another apparent character in the two substances, which alone would suffice to distinguish them from each other. This is the facility with which the grain of the *ergot* is detached from the plant; its friability, *pour ainsi dire*; whereas the *sclerotium* is horny, difficult to be cut, and not readily removed from the plant to which it adheres. He also stated having seen a plant, the lower part of which preserved its identic nature, while the upper half was *ergoté*.

Mons. Hazard suggested, that another means of ascertaining the difference between the *ergot* and the *sclerotium*, would be to institute some experiments on the effects of the latter on the animal economy, and to compare them with those which the *ergot* has been known to produce. (See Articles VI. and XI. of our last Number.)

M. Vauquelin read a report on a memoir of Mons. Dulong, on the combinations of oxygene and azote, and concluded with proposing its insertion among the memoirs of the *Savans Etrangers.* Approved.

M. Cuvier read a note on a fossil body, found generally in marine strata, and hitherto undecyphered by the naturalist. It is found commonly in the environs of Paris; and it has, by some, been considered as the claws of crabs, by others, as fossile teeth, &c. Specimens of these fossile bodies were presented to the class. The description was read, and it appeared, that the solution of this *geological puzzle*, accidentally occurred to Cuvier while dissecting the sæpia, on the anatomical structure of which he had lately been engaged. This fossile body is the hard and sharp part of the bone of that animal, as it is found even at present, with this difference only, that the *fossil* specimens are of a much larger size, and belong to an ancient world, but yet of so identical a nature with the modern, as to confirm us still more in the opinion, that "*La Nature des tems qui ne sont pas plus, étoit astreinte par les mémes loix que la nature d'aujourdhui.*"

Mons. Loiseleur read a memoir on a new classification of plants. Messrs. P. Beauvois and Mirbel, were named commissaries.

M. Laplace read a note *sur la Longueur du Pendule à Secondes.* This paper contains some observations on the manner of constructing a proper apparatus, in order to render the use of this instrument of the utmost exactness. One of the most important conditions in this case is, the choice of a proper absolute length in the pendulum, and that proposed and employed by Borda, seems to M. Laplace, by far the best, as leading to the most accurate results. The very little difference which exists between the results of twenty experiments, leave hardly any doubt on the correctness of the mean result. M. Laplace found, that in applying to those experiments, his formulæ of probabilities, scarcely an error of one hundreth of a millimetre could have occurred to Borda. But to render the absolute length correct, M. Laplace has ascertained, that the edge of the knife, instead of being linear, as commonly

thought of, is semi-cylindrical, and that its *radices*, instead of being added to, must be subtracted from the length of the pendulum.

Mons. Brongniart read a note on the *sodalite*, found on the summit of Mount Vesuvius, by Count Dunin Borkowowsky.

Messrs. Brongniart and Vauquelin were named Commissioners. The Academy resolved itself into a secret committee, for the presentation of candidates to fill the vacancies amongst the corresponding members in the section of geography and navigation. Adjourned.

Nov. 4th. The minutes of the last meeting were read and approved.

M. Cadèt presents a memoir, entitled " *Cadastre de la France*. M. Salva sends a letter, in which he demands, that the Academy should call for a report on the new astronomical ideas which he has proposed to the Academy. This demand was referred to the section of astronomy.

M. Le Chevalier Gauffridi also asks for a report on his memoir, in which he has detailed a new demonstration of the *Parallelogramme des Forces*.

M. Deschamp, surgeon, read a report on a memoir of Mons. Boyer, on some surgical points connected with the diseases of the intestines.

Mons. Moreau de Jonnés read a memoir on the extinct volcanoes of Martinique, with a note on the several earthquakes which took place in that island. Messrs. Lelievre and Brongniart commissaries.

M. Montain, a surgeon in the Hotel Dieu, at Lyons, read a memoir on different points of surgery, proposing some new operations, and offering two or three new surgical instruments. At the same time. Messrs. Pelletan, Deschamps, and Dumeril, were named commissaries, for examining and making a report on the memoir to the Academy.

After a few concluding formalities, the Academy adjourned.

Nov. 11th. The minutes were read and approved. The following works were presented to the Academy.

Dissertation sur les Odeurs, sur les Sens et sur les Organes de l'Olfaction.

Traité d'Anatomie déscriptive, par M. H. Cloquet.

Hommage aux Mânes de M. Parmentier, par M. Bouriat.

Précis analytique des Travaux de l'Academie Royale des Sciences, Belles Lettres, &c. &c. Rouen, *tom.* XI. and the same *Précis for* 1816.

Annales de Mathematiques pures et appliqués, tom. 7, No. II.

Journal de Medicine militaire, par Mess. Biron *et* Fournier.

Mons. St. Hilaire read a memoir on the plants employed for extracting indigo, chiefly drawn from English publications, and particularly from the works of Dr. Roxburgh and Mr. Brown. Mess. Deyeux and Mirbel were appointed commissaries for a report. M. Cassini, junior, read a continuation of his memoir on the family of plants called the *Synantherées.* The present paper contains an analytical view of the *ovarium,* and its accessories. Mess. Delamark, Jussieu, and Mirbel, commissaries.

The Academy resolved itself into a committee for a discussion on the merits of the candidates, proposed by the sections of agriculture and veterinary art, to fill the vacancies of corresponding members. Adjourned.

Nov. 15th. Minutes read and approved.

Mons. Azais presents a copy of his work entitled "*Manuel du Philosophe ou Principes eternels précedés de Considérations générales sur l'Epoque actuelle.*

M. Hazard presents a note on the words "*Hippiatre, Veterinaire,* and *Mareschal.*"

Mons. Mello Franco sends a copy of his "*Traité d'Hygiène.*"

Mons. Almeida a translation in Portuguese of Cuvier's "*Traité d'Histoire Naturelle.*"

Mons. Victor Jorges demands a report on his "*Pompe centrifuge.*"

Lambert proposes to explain to the Academy a mode "*Accorder la Préscience divine avec la Liberté de l'Homme.*" Declined.

Mons. Poiutot presents a clock "*à reveil et à briquet.*" This

clock consists in an ordinary movement, over which is an *alarum* bell with an apparatus for striking fire, and lighting a candle at the same time that the former is set in motion.

Baron Humboldt read, in the name of a commission appointed for that purpose, a project of instructions for Mons. Freycinet, who is about to set off on a voyage of discovery and observation. M. Humboldt's instructions relate chiefly to astronomical operations, meteorological, thermometrical, and barometrical observations. After the paper had been concluded several members present made some appropriate remarks, or suggested some important additions. Among these must be reckoned the one mentioned by Biot, namely, that when taking the altitude of the sun, the temperature of the air, and of the surface of the sea should be noted at the same time, in order to be enabled to make the necessary corrections, for the greater or less refraction of the atmosphere.

Mons. Moreau de Jonnés read a second memoir on the volcanoes of Martinique, which was referred for examination to the same commissaries charged to make a report on a former part.

The Academy next proceeded to the election of two corresponding members for the section of rural economy and veterinary art, and MM. Michaud and Clarke (London) were duly elected.

The section of geography presents a list of candidates for corresponding members, on whose merits the Academy proceeds to discuss in a secret committee. Adjourned.

Nov. 25. The minutes of the last meeting being read and approved, the secretary presented the following works:

Mémoires pour servir à l'Histoire des Mollusques, with plates, 1 vol. 4to. By G. Cuvier.

A letter was read from M. Michaud, thanking the Academy for the honour done him by his nomination to be a corresponding member of the Institute.

The Doyen of the faculty of medicine sends tickets of admission for the annual public meeting to be held this day at the Ecole de Medécine for the distribution of premiums.

M. C. de Montbret proposes, in addition to the instructions to be given to Freycinet, that he should be requested to collect and preserve the soundings in every part of the sea in which he

may have occasion to cast the lead. This proposition, which the author made likewise to the Geological Society of London some time since, is intended for the promotion of knowledge respecting the submarine geognostic formation. But we need not observe to the mover, that nothing but alluvial soil, or *debris* of shells, or clay and fine sand, can possibly be drawn up by the lead charged with tallow; so that we shall not be much more advanced in our knowledge of submarine geology, if by the proposed means, we are not enabled to ascertain the existence, the nature, the stratification, and the inclination of the rocks of various formations which may naturally be supposed to lie at the bottom of the ocean.

Mons. Ramond next read another project of instructions for the voyage in question, drawn up by the Committee of Geology and Mineralogy. M. Ramond begins his observations by pointing out the necessity of sending an expert mineralogist with the navigator, who is not to bring back a collection of cabinet specimens for the curious and the amateurs, but a general sketch of the great masses, as they may occur to him in the course of the voyage. He is not to return with fragments and vestiges, but with a general and a grand portrait of nature. He must be a good experimentalist; have a quick *coup d'oeil*; and seize at one view the object which has attracted his attention. These instructions go on to a great extent, through every point connected with the subject in question, and are divided into several classes. We hope to be able shortly to lay all these directions before our readers.

Mons. le Comte la Place, in reference to the astronomical observations to be made by Freycinet, read a note on the reciprocal action of two pendulums, and on the rapidity with which sound traverses different substances. He particularly insisted on the great precaution necessary for fixing the pendulum to a wall, which ought to be secure from all sort of oscillation.

Mons. Prony read a report on the clock presented last Monday by Mons. Pointet, and spoke favourably of the principle and of its execution.

The Academy then proceeded to the election of two corresponding members in the sections of geography and navigation, from amongst the following candidates.

Loewenhorn, at Copenhagen.
De Rosa, at Madrid.
Franzini, at Lisbon.
Le Comte de Blois.
Moreau de Jonnés.
Malavois, Pondicherry.

When MM. Loewenhorn and Moreau de Jonnes were duly elected.

Dec. 2nd, 1816. The minutes were read and approved.

A letter from Mons. Moreau de Jonnes to the secretary was read, thanking the Academy for the honour done him in having named him a corresponding member.

The following works were presented:

Traité sur l'Eclairage à gas. Par Mons. Windsor, who invites the members to witness some of the experiments upon the subject.

The same author presented a *Notice Historique sur l'utilisation ou Combustion du gas hydrogéne.* Mons. Biot was named to give an account of the above two works.

A manuscript by Mons. La Rosière, entitled "de Unione Mentis cum Corpore" was announced to the Academy from the Author (since printed.)

MM. Cuvier and Latreille presented their great work lately published in 4 volumes (the 3d entirely by Latreille) and entitled "Systeme du Règne animal." Deterville, 8vo.

Mons. Arago read a report on a memoir of Mons. Hachette, which, the reporter says, must be considered as a supplement to the descriptive geometry of Monge. Hachette has endeavoured to render the system of instruction on this subject much more easy, and independent of all differential calculus. The memoir containing several other very important points was much approved by the commissioners and their conclusions adopted by the academy.

Mons. Girard next read a report on a MS. work of a Mons. Bourny on the several machines and contrivances hitherto known and employed for the lifting and the transport of weights, &c. This work is a mere French translation of one published by the author in Italian, entitled, "Dello Studio delle machine." The

author was one of the chief engineers employed in Italy, and assisted in the construction of the great canal which joins the Adda to the Tesino, from Milan to Pavia.

Mons. Poinsot read a report on the memoir of Cheval. Gauffridi, in which this gentleman had pretended to give a new demonstration of the *Parallélogramme des Forces.* The reporter is of opinion that this memoir is unworthy of the attention of the Academy. Approved.

A deputation of two members, of whom one is a physician, was appointed to call on a member who is seriously indisposed, and to report on the state of his health to the Academy.

A person demands by letter a report on a new opera glass invented by him and presented to the Academy some time ago for their opinion.

The Academy proceeds to the election of three correponding members in the section chemistry, from amongst the candidates proposed for that purpose. The candidates were

Dr. Wollaston, London.
Mr. Dalton, Manchester.
Berzelius, Stockholm.
Berard, Montpellier,
Desormes, Paris.
Braconnot, Nancy.

1st. Scrutiny, Wollaston, 48 votes, the total being 51. Elected.

2nd. Scrutiny, Dalton 41 votes, the total being 47. Elected.

3rd. Scrutiny, Berzelius 46 votes, the total being 50. Elected. Adjourned.

Dec. 9th. M. Delambre presented the following works, and read the correspondence.

Mr. Clarke thanks the Academy for having named him a corresponding member.

Mons. de Montison sends a sealed packet containing several essays on various physical subjects, to be deposited at the library office of the Institute, and the date of reception marked.

The principal of the College at Briançon sends an instrument for geometrical calculation, Poinsot and Ampère commissioners.

A note was read on certain fossile bones found in a village

gar den nealyons, supposed to be those of an elephant. The longer fragment is nineteen inches long and four wide, and in all appearance a humerus; another has the form of a femur. These fossile remains had been discovered by some children who played with them, and consequently broke them; since which time they had been lying unnoticed in the corner of a court yard. To account for the existence of these bones the writer reminds the Academy of the probability of Hanibal having crossed the *Rhône* near Lyons, with an army of which elephants form part of the train; and the possibility of one or more of those animals having perished while staying in the neighbourhood of the place where the fossile bones have since been discovered. M. Cuvier was appointed to examine them.

A copy of the *Réfutation de la Doctrine de Montesquieu, sur la question de la balance des pouvoirs et sur plusieurs autres questions de droit publique*, was distributed to each of the members present. This work is by M. L. St. Roman.

A MS. work, having for title, *Précis d'un Traité analytique de Trigonométrie sphérique*, was referred for examination to Messrs. Arago and Delambre.

M. Lemercier sends for distribution copies of his play, entitled "*Le Frère et la Soeur, ou les Jumeaux.*"

Mons. Jorge, the mechanist, sends, for examination, a machine, presenting at one view, and therefore perfectly calculated for the use of schools, the terrestrial and celestial globes, by which problems in geography and astronomy may be readily resolved. MM. Bouvard and Arago were named commissaries.

A letter from Signor Flauti, secretary to the Royal Academy of Sciences, &c. of Naples, was read, accompanying a work lately published by him on geography. Referred to M. Ampère for a *rapport verbal*.

M. Brongniart read a report on the memoir of Count Borkowsky, on the sodalite found at the summit of Mount Vesuvius. This mineral, perfectly crystallized, was picked up by the author at the *Fosso Grande*, and seemed to him to differ particularly from the numerous other species of minerals found in the same locality. He ascertained it to be *sodalite*, presenting

some regular cristals, and at times only round grains. The form of the crystals is a four-sided prism, terminated by a three-sided summit, whose faces alternate with three of the edges of the prism. The fracture is conchoidal—some laminæ may be distinguished parallel to the faces of the prism, but the cleavage is difficult to be ascertained.

The mineral in question is transparent, and easily scratched by steel. Its specific gravity is = 2. Specimens upon which nitric acid has been made to act, become covered with a whitish crust. It is fusible before the blow pipe, but with some difficulty. The analysis, by M. Borkowsky, gives for its composition,

Silica	.45
Alumina	.24
Soda (trace of potash,) .	.27
Iron, lime, loss	4
	100

Mons. Girard read a report on a *Pompe centrifuge*, presented by Mons. Jorge, de l'ancienne marine royale.

Mons. Pelletan, junior, read a memoir *sur l'Eclairage à Gas*, which is a mere compilation of facts, already well known both in England and France. The late improvement made by M. Clegg, by substituting the horizontal flat retorts for the common ones, was announced as yet unknown in France; but the writer was probably unacquainted that the account of this improvement was announced in the month of October, to the Academy, by one of the secretaries, when he presented the IIId Number of the Journal of Science to that body. Adjourned.

Sitting of the 16th December. The Minutes of last meeting were read and approved. The following works were presented:

Mémoire sur les Animaux invertebrés, par Cæsar Savigny.

Traité d'Electricité et de Galvanism, by John Singer, translated by Mons. Tillaye, with notes and additions.

Mons. Biot is to give a verbal account of this work.

A letter was read from a M. F. Neufchateau, sending a memoir, intitled, *Essai sur les meilleurs ouvrages écrits en langue Françoise, et sur "Les Provinciales de Paschal," principalement.*

In this short memoir the author traces the history and progress of the French language and thinks he has found the solution of the problem, why the said language had at one time made so little progress, in the works of the above named eminent writer.

Mons. Latreille presented a memoir *sur la Géographie des Insects.*

Mons. Bourgeois sent his third lecture "*sur la Lumièré et les Couleurs.*"

The articles contained in the last number of the Annales de Mathematique, par Mons. Gergone, were read by the Secretary, as well as those contained in the XVII. vol. of the Italian Society, parte Fisica.

A letter from Colonel Mudge was read, thanking the Academy for the honour done him in admitting him a corresponding member thereof.

Some astronomical observations made by the director of the observatory of Toulouse, during the last solar eclipse, were read, together with a letter containing important astronomical information, from Mr. Burckhardt.

Mons. Girard read a report on a memoir, in which the author, Mons. Grosbert, enumerates the defects existing in the modern way of constructing theatres, and proposes some improvements, while he endeavours to remedy the existing defects. The improvements chiefly relate to the change of scenes, to the mode of lighting the theatre, and to the position of the orchestra. Proposed that a mixed committee of the Academy of Sciences and that of the Fine Arts should take the propositions into consideration.

M. Desvaux read a memoir, containing a further account of his researches on the Genera of the *Lycopodeæ* and the *Ferns.* The present is merely an extract of his great work on the same subject, written in Latin: and he states his reasons for adopting the new classification and specification of those plants, which he has there proposed—and for the changes made by him in the arrangement already established by other botanists. Messrs. Lamarck and Jussieu were named commissaries for a report on this memoir.

Messrs. Poinsot and Maurice were appointed to examine a

memoir of Mons. Lainé, proposing a new mode of expressing certain geometrical equations, and the enunciation of some new formulæ, by which several interesting problems are resolved, and some new theorems proposed.

M. de Jonnés read some observations on the Mountains of Martinique.

Dec. 23d. Minutes of last meeting were read and approved. M. Humboldt presented a copy to the Academy of his recent work *de Distributione Geographica Plantarum, Prolegomena.*

A letter from the Academy of the Fine Arts was read, proposing the nomination of a joint committee, for a report on Mons. Grosbert's proposed alterations in scenic decorations.

The Numbers of the *Bibliothèque de Geneve* for September and October were presented by the editors.

MM. Delambre and Arago read a report on a MS. Treatise of Spheric Trigonometry, by Mons. Henry. This work, the reporters think, contains a rich collection of the most useful and simple formulæ, that can be employed with advantage for the solution of every sort of problem in astronomy and geodesy. The pyramid is determined by M. Henry with some equations, which, though not new in themselves, serve to give rise to four expressions, which the author presents as quite novel of their kind. These expressions, the reporters think, are not complete; but a few additions would make them so. The two thousand formulæ contained in this work are divided into four classes; and though the practical part of them presents few novelties, still the great light which M. Henry has thrown, by his method, on the requisite calculations, renders his work highly important and advantageous. The conclusions of the reporters, which were favourable to the author, were adopted by the Academy.

M. Vauquelin read a report on a work of Mons. Caventon, *Sur la nouvelle Nomenclature chimique.* (Want of room obliges us to defer the insertion of an article we had written on this work, till the next Number.)

MM. Berthollet and Vauquelin read a report on a memoir of Mons. Chevreul on Fat Substances (see our IIId Number). In the course of this report some very apt animadversions

were passed on the new names which the author proposes to substitute, in some cases, to those already known and generally adopted.

The Secretary mentions that a Professor Rutiger has sent a letter, in which he states to have discovered the quadrature of the circle. (general laugh).

M. Laplace read a note on the Velocity of Sound (see our Analytical Review).

M. Biot read a paper on the Intonation of Tubes of Organs filled with different Gases (see our Analytical Review).

A report was read by Mons. Arago on some new opera-glasses constructed by Mons. Rebours; at the conclusion of which, this eminent *physicien* and mathematician took an opportunity of saying, that France had need to be proud of her opticians, since he could assure the Academy, that the *ateliers* of some of the first artists in Paris contained, at this moment, much better glasses, than are to be found at the houses of the most eminent opticians in London.

A memoir was read of Mons. Prony on the Difference between the *Pouce* de Fontainier and the *Roman Inch of Water*.

Mons. Cauchy, in a note which he read to the Academy, proved, that every equation has a real or imaginary root of this formule, $a + b\sqrt{-1}$.

Dec. 30th. After approving the minutes of the preceding meeting, the Academy heard the reading of a letter from the Perpetual Secretary of the Royal Academy of Sciences of Brussels, sending a programme of their public meeting.

Several letters of thanks, amongst which we distinguished one from M. Bessel, were read from some of the newly elected corresponding members.

Another letter was read from M. Svanberg, Perpetual Secretary to the Royal Academy of Stockholm, detailing a considerable series of distances, calculated from the polar star to the zenith, of which he had not taken notice in his work, owing to some irregularities in the pendulum. But subsequent considerations have proved to him, that considerable advantage

might be derived from those observations, as they agree to a great extent with those previously employed. It appears from the recent researches of Mons. Svanberg, that the depression resulting from the comparison of the Lapland degree with that of France is $\frac{1}{300}$.

The report of the joint committee on M. Grosbert's proposed improvements in scenic decorations, was read by M. Thibaut, of the Academy of Arts; and the conclusions were favourable to the author.

M. Lucas, sen. presented a newly improved gun. MM. the Duke of Ragusa, Prony, and Thenard, commissaries.

A memoir was read by Dr. Fournier, on the *Grasseyement* (defective pronunciation of the letter *r*), which he divides into five species, each of which was particularly described, and illustrated with examples. The English, according to the author, present a remarkable instance of the fifth species of this *grasseyement*; so do the ladies in general; and so did Alcibiades. This is particularly due to a *lazy* habit of the tongue! The proposition that all sorts of *grasseyement* are due to bad habits, is only true in part; as some of them are evidently derived from certain modifications of the tongue—such as shortness, thickness, &c. The Greek and Latin languages did not admit of this defect; and Alcibiades was the only exception to the contrary. The reason is, that those languages required much energy of enunciation. The Spaniards and the Italians do not *lisp*, for the same reason; nor do the Arabs present any defective pronunciation of the letter *r*, though they have another kind of *grasseyement*. The northern languages, on the contrary, full of confused sounds and consonants, offer numberless instances of this defect. To prove that the letter *r* is calculated to give great energy and force to the pronunciation of any language, Dr. Fournier instances the Chinese, in which that letter is not to be found; and which is, consequently, lifeless and monotonous. A Chinese who is to pronounce a foreign language generally substitutes the letter *l* to *r*, and thus pronounces Paris, Amour, Riche: *Palis—Amoul—Liche.*

M. Gay Lussac read a report on Mons. Robinet's French Translation of John's Tables of Animal Chemistry. Adjourned.

Jan. 6th. A letter from the Minister of the Interior was read, sending an ampliation of the *ordonnance*, by which the King approves the internal regulations of the Institute.

The *Annales de Chimie et Physique*, for October, were presented; also

The *Annales Maritimes et Coloniales*.

The Academy proceeds to the election of a Vice-President, M. Ramond having taken the chair as President, according to custom. Out of 47 members present voting, 38 were found to be in favour of M. Rossel, who took his seat accordingly; and in an appropriate speech thanked the Academy for the honour conferred on him. M. Charles of course retires from the Presidentship.

A committee of administration for the year 1817 was also appointed.

M. Biot made a report on two distinct works of M. Windsor, which the author had presented to the Academy. They relate to the gas lights. It was stated on this occasion, that Lebon, a French engineer, had certainly the honour of the discovery, in the application of hydrogen gas to the purposes of extensive illumination.

The same savant read another report on a French translation of Singer's work on Electricity, by M. Thillaye. M. Biot thinks that the practical part of this treatise, in which the various apparatus and experiments are detailed, deserves much commendation; but that the historic part is very imperfect. The researches of Coulomb and Laplace are not even hinted at. Those of several others are either entirely forgotten, or incorrectly stated; perhaps from not having been properly understood, as M. Singer, according to the reporter, does not seem to have a clear idea of the theory of electricity. The notes which M. Thillaye has added to the original work, in his translation, and which have augmented the former of more than one-third, are loudly extolled by M. Biot, who thinks them well adapted to supply the deficiencies of the original.

13th *January*. The minutes of the preceding meeting being read and approved the Secretary presented the following works.

The Journal of the Royal Institution of Great Britain, No. IV., by the Royal Institution.

Tables des diviseurs pour tous les nombres du premier million. by M. Burckhardt.

M. Deyeux read a report on a memoir of Mons. Desvaux on the principles of vegetable bodies (see Analytical Review.)

A memoir was read by M. Biot giving an account of some new experiments on the polarisation of light in crystals. The author was led to the present inquiries, by an extract of the paper, given in our last number, of Dr. Brewster which was read before the Royal Society in December last. It appears that our countryman had been the first, who obtained, in double refracting and regularly crystallized bodies, certain modifications of the polarizing forces, by means of pressure. Biot repeated the experiments, ascertained, and found the fact to be correct; and going further than Dr. Brewster in his inquiries, he also found that the phenomenon took place, not only when the transmission of the luminous rays in the interior of the crystal was parallel to its axis; but also in every other direction.

M.Girard read a memoir on the *Ecoulement linéaire des diverses Substances liquides, par des tubes capillaires de verre.*

M. Bertrand read a memoir on certain phenomena observed in the baths of *Mont d'Or*, at the approach of thunder storms. MM. Pinel and Gay Lussac were appointed to examine it.

A fresh committee was named to propose a new subject for the prize in physical sciences. Gay Lussac, Charles, Biot, Berthollet, and Laplace were named for that purpose.

20th January. The following works were presented: Transactions of the Geological Society, vol 4th, part 1st, plates, with a letter from Dr. Granville the foreign secretary.

Journal de Pharmacie for December.

Journal des Crues et Diminutions des Eaux de la Seine observées en 1816, par M. Sauvage.

Memoirs of the Society of Arts and Agriculture of the department of Seine et Oise, 16th year.

Several commissions were appointed for the examination of various unimportant subjects.

M. Girard continued the reading of his memoir.

M. Moreau de Jonnés read a memoir on the influence which the climate of the West Indies seems to exert on the vegetable and animal kingdoms, and on the human species. Adjourned.

27th. *January.* Mons. Brompt sends a memoir on the *calculation* of *variations.* Laplace, Legendre, and Maurice were appointed to examine it.

M. Bessel sends the calculation of the observations made by Bradley in 1713, and Mayer in 1759 on the Georgium Sidus.

M. Moreau de Jonnés presented a statistical essay on the French Guyana. MM. Prony, Rossel, and Coquebert Maubray are to examine it.

A Latin memoir of M. Langsdorf was presented, on the movement of water in canals the superior opening of which is prismatic. MM. Prony and Girard will give an account of it to the Academy.

Two reports were next read on surgical subjects, by Percy and Pelletan; the one on the rupture of muscles by Sedillot; the other on a new mode of amputating the wrist.

Mr. Dizy, a Flemish artist long settled in England, presented his much improved harp M. Charles reading a descriptive note of the innovations and ameliorations, at the same time. The Academy was next delighted with the execution of some sonatas on this instrument by this skilful performer. Adjourned.

Feb. 3d. The minutes of the preceding meeting having been read and approved, the secretary proceeded to the enumeration of several works presented to the Academy, such as

The Annals of Public Administration; a new periodical publication.

Prospectus of a General Meeting of the Veterinary and Agricultural Schools of Lyons, and of Alfort.

Instructions relative to the *Pourriture des Bêtes à laine.*

M. Delambre was about to read a report on a mathematical memoir, when it was proposed to adjourn it for the concurrent opinion of Mons. Laplace, one of the commissaries appointed to examine it.

M. Biot stated, that the commission charged to examine the memoirs presented to the Academy, for the prize in the physical sciences, had not found amongst them, any one worthy the attention of the class, and proposes a further prorogation of the subject to January, 1818.

Mess. Gay Lussac and Pinel presented a report on a memoir of Mons. Bertrand, respecting the baths of Mont d'Or. These baths present the following circumstances.

1st. A constant temperature to 43° centig.

2. A considerable portion of carbonic acid in solution, both in the water and the atmosphere, which must be considered as causing great irritation to the skin and the lungs.

3. An atmosphere generally hot—always humid, even when quite transparent,—at times stagnant; but now and then renewed by the fresh and less humid external air.

All this tends materially to explain some of the effects attributed to the waters of Mont d'Or. Although the patients can generally bear to remain in them for the space of fifteen or eighteen minutes, yet there are times, when an immersion of more than seven minutes becomes insupportable, and would be followed by dangerous consequences, were it persisted in. M. Bertrand is disposed to attribute this to electricity, and the approach of storms; an opinion which was greatly strengthened by some experiments made for the purpose of ascertaining how far it was correct. The commissioners, however, while they acknowledge that they cannot give any decided opinion as to the facts, declare, that without doubting the veracity of the author, the good effects of the baths, and the more extraordinary ones attributed to the electric fluid, are solely to be derived from the temperature of the water, and the chemical state of the atmosphere. Mons. Bertrand having used one of Cavallo's electrometers, placed in a convenient manner in the rooms, observed it give signs of electricity four or five times. "This is easily explained," says the author, "by supposing, that in the operation which takes place, for the re-establishment of a broken equilibrium of electricity, between the earth and the air, the electric fluid

must, in its course of transmission, prefer the tortuous windings of the thermal waters, and having reached their open surface, dissipate itself into the atmosphere, along with the vapours inhaling from them." But the reporters very justly oppose this explanation, and shew that it is not agreeable to the well known laws of physical science, and of electricity. They conclude with proposing, that the Academy should encourage the author to a repetition of his observations, recommending, at the same time, a greater degree of attention to the atmospheric modifications. Approved.

M. Girard concluded his memoir on the *Ecoulement des Liquides.*

L'Abbé Rochon read a note on a new and effective mode of joining together the fragments of a broken lens in telescopes, so as to render it again perfectly serviceable. M. Arago adds, that he has found, upon trial, Mons. Rochon's method to answer perfectly.

The Academy then proceeded to the nomination of a committee of five members, for awarding Lalande's medal. These are, Mess. Delambre, Arago, Burckhardt, Laplace, and Bouvard. Adjourned.

Feb. 10. After reading the minutes of the preceding meeting, M. Delambre presented the following works.

Journal of the Royal Institution of Great Britain, No. I. and II. (Second Edition,) which were wanting to complete the collection. By the Royal Institution.

Mémoire sur la Nécessité de Rétablir l'Ecole de Chirurgie, telle qu'elle fut fondée par Louis XV. Par M. Caron.

A Latin poem, by Cauchy, senior, on a political subject.

Annales de Chimie. Par Gay Lussac and Arago. November, 1816.

M. Thilorier, in a letter which was read by the secretary, requests that the Academy will have the goodness to name a commission, for the purpose of assisting at the experiments to be made on the River Seine, with his double *plongeur.* Mess. Prony, Perrier, and Sanè, were named accordingly

M. Biot next read the new prospectus for the prize proposed in physical sciences, which is to consist in ascertaining

mathematically, the laws of the difraction of light. M. Arago begged to observe, that the manner in which the subject for the prize was expressed in the prospectus, was contradictory with the decision which the Academy had given on a former occasion, when on his making a report on certain experiments of Dr. Young, relative to the same subject, the conclusions of that report, tending to prove that the laws in question had been found by that eminent philosoper, were unanimously adopted. We should therefore, *continued* he, expose ourselves, to see the prize carried by a person who will not have added one iota more to what Dr. Young has already demonstrated, and who will, at most present us with a repetition of his experiments. M. Laplace was of a quite different opinion. The Academy ought, on the contrary, to encourage the repetition of the experiments in question; as he was far from thinking that the point in doubt had been completely illustrated. He meant no allusion to any particular theory; for the subject of the proposed prize related to mere matter of fact, and was wholly independent of the doctrines of emission or undulation.

M. Arago explained.

M. Biot observed, that the commission had in view to promote the institution of experiments tending to establish the laws by which the phenomena in question were regulated—and not to show how those phenomena were produced.

M. Legendre was of opinion, that the commission charged to draw up the prospectus of the subject for the prize in question, had not been sufficiently explicit: it was clear that not only Dr. Young, but many others, such as Arago, &c. had already done much towards the elucidation of the point under discussion. Their experments and conclusions ought therefore to have been mentioned, in order to put the candidates in the way of repeating, or multiplying their inquiries on a subject of so much importance.

M. Prony proposed as an amendment, that the prospectus should mention what had already been done on the subject of the prize proposed; and that it should explicitly demand from the candidates, to ascertain, by new experiments, how

far what had already been effected, was correct, and might be confirmed.

M. Laplace thought it his duty to oppose the amendment, which was, however, carried by a large majority, and the prospectus with the amendment finally adopted.

The suspended report by Mons. Delambre, on a translation of another part of Euclid's works, by Mons. Peyrard, was read, and its conclusions adopted.

M. Ampēre read a report on a mathematical memoir of M. Berard.

M. Jambon presented to the Academy two new planetaries. Messrs. Burckhardt and Arago were appointed to examine them, and make a report.

M. Arago described verbally, the aurora borealis, which appeared at Paris on the 8th of February. The amplitude of the arc was 120°. The culminant point was situated in the magnetic meridian; in every other respect it resembled the aurora borealis so often described by Mairan.

A new arrangement and application of what is generally called Zamboni's pile, was presented to the Academy by M. Rousseau. In some of the columns, the manganese opposed to the zinc, is mixed with some pulverised oligistic iron; and the author pretends to have thus developed the magnetic fluid, by means of an accumulation of an electric and magnetic apparatus. A magnetic bar is made to move horizontally and alternately by the combined fluids; and a spark of some intensity, is given out at every contact of the bar with one of the poles of the arrangement. Messrs. Gay Lussac, Biot, and Thenard, were named commissaries,

Baron Larrey read an account of the amputation at the hip joint, performed by M. Guthrie, at Brussels, on a soldier of the French guard. Adjourned.

Feb. 17. Minutes read and approved.

The following works were received.

Journal général de Litérature de Jena. *Oct. Nov.* 1816.

Idem ——————— ————— *de Leipsick.* *Idem.*

Bulletin des Sciences de la Société Philomathique. Jan. 1817.

Instruction concernant la Panification des Bléds.

The Rights of Literature. By M. Britton.

Journal de Pharmacie. Jan. 1817.

Two reports, on mechanical and mathematical subjects, were demanded, and commissioners appointed to draw up the same.

M. Vauquelin, in the name of the commission appointed to examine the memoir, sent to the Academy for the prize proposed by *M. Ravrio,* for finding an effective mode to prevent the bad effects of mercurial effluvia in the art of gilding, states that none of them have complied with the conditions, and proposes the further prorogation of the prize to next year. Adopted.

M. Beudant read a memoir on the mutual assistance of chemistry and crystallography in the scientific classification of minerals. To ascertain how far a foreign substance might be mixed with a salt without altering its essential form, the author made some experiments, by which it appears, that the form of the sulphate of iron, for instance, continues unaltered even when 97 per cent. of sulphate of copper are present.

M. Majendie read a memoir, giving an account of some experiments made with a view of ascertaining the action of arteries on circulation. The Doctor concludes from his observations—1st. That neither the larger nor the smaller arteries present any trace of irritability. 2. That they are dilated during the systole. 3d. That they are capable of contracting themselves with sufficient force on the blood they contain, so as to propel it into the veins. 4th. That the blood in the arteries is not alternately at rest and in motion; but that it is, on the contrary, in a continual succedaneous (*saccadè,* by little jerks) movement in the trunk and the ramifications; and uniform in the smallest ramifications and divisions. 5th. That the contraction of the heart and the contraction of the arteries, have a considerable influence on the course of the blood through the veins.

These conclusions are applicable to man and the mammiferous animals, on which Dr. Majendie has made his experiments; but he is far from drawing any inference in regard to those he has not had an opportunity to examine. MM. Percy and Biot were named commissaries for a report.

M. Virey read a note on the nature and generation of intestinal worms. Adjourned.

Feb. 24. M. Salvo demands a report on a memoir he presented to the Academy, on certain astronomical and trigonometrical discoveries he states to have made. The Bibliothèque Universelle, for December was presented. A gentleman, whose name we could not learn, announces the invention of a spy glass by which objects may be seen at a distance, notwithstanding the interposition of elevated parts obstructing the direct sight. Another solution of the quadrature of the circumference, was presented to the Academy.

Colonel Grosbert presents a model illustrative of his intended ameliorations in scenic decorations, and explains, verbally, its construction.

MM. Majendie and Pelletier (pharmacien) read a memoir on ipecacuanha, in which they detailed some analytical experiments made on the psycotria ipec. cynanchus ipec. et viola ipec. They succeeded in separating the emetic principle from all, but in various proportions: the first yielded 16, the second 14, and the third only 4 per cent. of *emetine*, such being the name given to this principle. Adjourned.

Art. XVI. *Analytical Review of the Scientific Journals published on the Continent.* *Continued from page* 453, *Vol. II.*

The foreign journals appear very irregularly; we are therefore either subjected to the inconvenience of noticing in one review, four or five numbers of each, or to the no less unpleasant alternative of leaving them unnoticed, till their novelty, and much of their consequent interest, are gone by. In the present article, therefore, we balance our account with them to the conclusion of last year, for two only, have hitherto made their appearance in 1817.

Bulletin des Sciences, par la Société Philomathique.

SEPTEMBER.

Art. I. The four first articles have already been before our readers.

Art. V. *Mémoire sur la Variation des Constantes arbitraires dans les Questions de Mécanique; par M.* Poisson.

The generalisation of the theory of varying the *constante* of the elliptic movement of the planets round the sun; and its application to all the problems of mechanics in which a movement produced by certain given forces, is disturbed by others much smaller in proportion to the former, is due to the great Lagrange, and was one of his last, and not least elegant works.

The formulæ serving to explain and calculate this phenomenon, given by Lagrange in 1809, did not resolve the problem so generally, as those which were given a little time afterwards by M. Poisson, and which were almost the reverse of those of the former great geometrician. The result obtained by Poisson were in some respects particularly satisfactory, but as part of the problem remained still unresolved, he has, in the present memoir, endeavoured to shew that the differentials of the *constantes*, or at least a part of them, may be obtained by a method independent of the nature of the problem.

Art. VI. *Construction d'un Colorigrade; par M.* Biot.

We have announced the presentation of this instrument to the Academy by the author in a former Number; and endeavoured to explain its use from what we had heard from M. Biot himself, who explained its application for the purpose of determining, in a fixed and unalterable manner, the variety of colours occurring in organic and inorganic bodies, so as to be able to retrace them in a correct manner, and thus avoid the desultory mode of describing colours by terms of comparison, or by names which seldom convey to different persons one and the same meaning. We wish our time and limits allowed us to enter

further into the details of this elegant apparatus; but the length of the paper and the nature of it are such, as not to admit fairly of curtailment; and we should encroach on the space destined for other matter, were we to give a complete translation of the whole memoir.

Art. VII. *Supplément à la Théorie analytique des Probabilités, par M.* Laplace.

We suppose our readers acquainted with the great work of this eminent mathematician on Probabilities, to which the present is a kind of appendix. This supplement is divided into two parts. In the first the author gives some new developments to his method known under the name of *Methode des moindres carrés;* he exposes the means of facilitating the use of it, and removes certain difficulties, which the analysis of the numbers 19, 20, 21 of the second book of his work might leave. He next takes for example the observations of Saturn and Jupiter, calculated by M. Bouvard, and by which a mass has been given to Jupiter equal to $\frac{1}{1070}$ that of the sun. In determining the probability of this result, according to Laplace's method, we find a million to one, that M. Bouvard is right in his conjecture. The second part of the Supplement is relative to the probability of judgments—a question hitherto but incorrectly developed, notwithstanding its great importance to every class of society.

OCTOBER.

Art. I. *Sur un nouveau Gisement de Calcaire d'Eau douce près de Montpellier.* Par M. De Serre.

Art. II. *Expériences sur le Gas hydrogène-phosphoré.* Taken from the Annals of Philosophy.

Art. III. *Note sur un Individu qui peut avaler son langue.* Par F. Majendie.

To swallow one's own tongue is considered by modern physiologists as impossible. M. Majendie allows, that in cases of perfect conformation of the parts, particularly of the mucous membrane lining the internal surface of the lower jaw, and the

inferior portion of the tongue, this singular act cannot take place; but he also thinks, from what he has seen, that where any deviation in the regular conformation of those parts exist, the swallowing of the tongue is not impracticable.

The case he quotes is that of a foreign soldier, who having, when a child, seen a Jew double his tongue backwards, and plunge it with the greatest ease into the pharynx, began from that moment to endeavour to imitate him. The first efforts proved unsuccessful. At length he ruptured the frænulum, and a hemorrhage was the consequence, which did not alarm the boy, for he found from that moment he could better imitate his master. Continued repetition of this practice soon put him in possession of the singular faculty of swallowing his tongue, without the least inconvenience to his respiration.

Art. IV. *Essai géognostique sur l'Erzgebirge.*

This has been printed in the Journal des Mines some time ago. It is by M. Bonnard.

Art. V. *Observations sur quelques Combinaisons de l'Azote avec l'Oxygène, par M.* Dulong.

We have already noticed this paper.

Art. VI. This is an extract of M. Cassini's memoir on *a new Family of Plants.*

Art. VII. *Observations qui prouvent l'Indépendance absolue des Forces polarisantes qui font osciller la Lumière et de celle qui la font tourner, par M.* Biot.

From the experiments made by this eminent philosopher on the subject announced in the title of this memoir it appears, that the absolute independance of action existing between all kinds of attractive and repulsive forces presented to us by nature, holds good also with regard to the luminous molecules previously affected by either a double attractive, or a double repulsive refraction.

Art. VIII. IX. X. and XI. *already noticed.*

Art. XII. *Second Mémoire de M. Hachette sur l'Ecoulement des Fluides par des Orifices en minces Parois, et des Ajutages cylindriques ou coniques.*

We have already mentioned this memoir, which was read as far back as August, and an account of which will be found in a former number.

NOVEMBER.

Art. I. the same as Art. VII. in the *Annales de Chimie* for September.

Art. II. *Note relative à l'Article précedent.*

This article by M. Poisson gives some algebraic formulæ for obtaining the result mentioned by Laplace, when speaking of the absolute length of the pendulum, from which the radius of the semicylindrical edge of the knife must be deducted. These formulæ are distinguished by that accuracy and elegance, which characterise all the researches of this very profound mathematician.

Art. III. *Analyse chimique de plusieurs Mineraux* (taken from the Annals of Philosophy for September.)

Art. IV. *Sur la Succession des Couches qui constituent le Fond du Vallée du Rhône dans les Environs de Geneve, par M.* Poret Duval.

This memoir was read at the Society of Naturalists of Geneva, a few months back. The author beginning with the deepest strata known, enumerates the successive formations in the following order: 1st. Limestone raised by and leaning against the weft part of the Saléve. 2ndly, Strata of micaceous grès, constituting the hills of Cologny, Pregny, Chalex, &c. and forming the bottom of the lake. 3dly, A series of stratified marl to the number of fifty different varieties, containing some beds of *grés*, and presenting some varieties of a reddish and grayish colour, the latter being superior, the former are below. 4thly, Towards the superior part of the clayey formation, a bed of compact *marne gypsifère* is to be found, containing veins of

striated gypsum crossing each other in every direction. It is in this same part of the formation, that the author mentions having found a bed of combustible matter, which he calls *houille terreuse*, and which is said to contain some remains of fresh-water univalve shells. 5thly, The whole is covered by a thick bed of rounded pebble-stones, more or less cemented together by marl, which is 20 metres (65.5 feet) thick, where it dips under the present channel of the river Arve.

Art. V. *Sur la Réunion de la Lepidolithe avec l'Espéce des Mica, prouvée par la Comparaison des Forces polarisantes, par M.* Biot.

It had been suspected, but never proved, that the lepidolithe belonged to the species mica; but the want of regular crystals, and some difference in the chemical analysis of these two substances, had left the point undetermined. M. Biot, however, having observed, that the characters, as derived from the intimate and essential properties of minerals, do not present the smallest difference, is inclined to believe that the two substances in question are perfectly identical. The following are M. Biot's observations: 1st. Mica is the only crystallised substance hitherto known presenting two axes from which two polarising forces are emitted—the lepidolithe has two axes also. 2ndly, One of the axes of the mica is situated in the plane of its laminæ, and the other perpendicular to them; the same in the lepidolithe. 3rdly, Both axes in mica are repulsive, and so they are in lepidolithe. 4thly, In mica the normal axis is the most energetic, and its intensity is to that of the other axis as 677 is to 100. Exactly the same proportion may be observed in the lepidolithe. The polarising forces of the two substances are therefore the same.

Art. VI. *Sur la Sodalite du Vesuve, par M. le Comte* Dunin Borkowsky.

Art. VII. *Sur la Déperdition de Calorique qu'occasionne le Rayonnement des Corps vers le Ciel*

Mention is made in this article of the fact ascertained by Dr. Wells, and proved by an elegant experiment by Dr. Wollaston, who did not, however, anticipate the real theory of it, first imagined by the former, that if a substance be exposed to

the open air at night, in calm and serene weather, its temperature will soon become lower than that of the surrounding air. Dr. Wollaston exposed a concave metallic mirror turned upwards, to the free air, with a thermometer placed in its focus, and proved the lowering of its temperature after a short time of its being thus exposed.

This article, written by M. Biot, concludes with these words; "Nous devons la connaissance de cette belle expérience à M. Wollaston lui-même, ainsi que les restrictions indiquées relativement aux conséquences qu'il en avait déduites. Personne n'ignore que, dans ce célebre physicien, la candeur et l'esprit de justice, ne le cèdent point à l'invention."

Art. VIII. *Notice sur la Structure du Vallon du Locle, par M. de* Van Buch.

This memoir is taken from a manuscript of the above eminent geologist, now in the possession of the city of Neufchatel, and communicated by D. Berger of Geneva. The Valley of Locle is situated in the canton of Neufchâtel, and 2956 French feet above the level of the sea. The geological description of it is given, with many curious details, to which M. Brongniart has added some important notes and illustrations.

Art. IX. *Sur une Femme de la Race Hottentote, par M.* Blainville.

This description of the Hottentot Venus was read at the Philomathic Society in 1815; it consequently contains nothing new. We need only remind our readers, that Dr. Somerville, one of the principal inspectors of hospitals of the British army, who resided some time at the Cape of Good Hope, has given a complete and elegant description, in Latin, of this singular race of people, published in the Transactions of the Medico-Chirurgical Society of London.

Journal de Pharmacie et des Sciences accessoires.

AUGUST, 1816.

Art. I. *Mémoire sur la Gomme d'Olivier, par M.* P. Pellitier.

(See our Third Number, page 176.) In this memoir we find

the principle discovered by Pelletier in the above gum, called *Olivile,* and no longer *Olivine,* to distinguish it, no doubt, from the mineral substance bearing the latter name.

Art. II. is taken from the *Annales de Chimie.*

Art. III. *Perfectionnement des Appareils Portatifs destinés à la Purification de l'Air d'après les Procédés de G. Morveau, par M.* Boullay.

We cannot, without the assistance of the plate, and without entering into details, which would be long and tedious, give an account of this *perfectionnement,* which seems to consist chiefly in the employment of glass bottles containing *chlorine,* having a conic opening, and a conic stopper, kept down, when not in use, by a forcing screw, which may be turned at pleasure, from outside of the box containing the apparatus. When it is wished to allow the gas to escape, it is only necessary to open the forcing screw, and the stopper being raised by the expansion of the gas, the latter will issue from the bottle and the box through two openings made in it for that purpose.

Art. IV. Describes an improved pounding mortar for apothecaries and druggists.

Art. V. *Quelques Expériences sur l'Ail, par* Bouillon La Grange.

Garlic had already been analysed by Neumann and Cadet Gassicourt. M. Lagrange therefore simply adds some facts observed by him in the course of some recent experiments made on that substance. The result of these experiments gives us for the composition of *garlic* the following substances.

1. A very acrid and volatile oil.
2. Sulphur.
3. A small quantity of mylaceous fecula.
4. A Vegetable albumen.
5. A saccharine matter.

Each of these substances, when separated, preserve still a strong smell of garlic, in consequence of retaining the volatile oil. The sulphur is obtained, combined with hydrogen, on distilling garlic with water.

Art. VI. Taken from the *Bibliothéque Universelle,* pag. 129, tom. I.

Art. VII. continuation of M. Guibourt's memoir on mercury and its combinations with oxygene and with sulphur, mentioned in No. III. of our Journal, p. 171.

Art. VIII. *Formule du Sirop sthénique amer et composé.*

This article belongs more particularly to a journal of medicine. We shall only observe, that if the virtues of a pharmaceutic preparation depend upon the number of its ingredients the present syrup must be an admirable remedy. It contains no less than thirteen substances. " Si l'on ajoute, (says the learned editor) sublimé corrosif gr. IV. à chaque demi-bouteille, on a le syrop sthénique *composé;*" the former one being, of course, *quite simple.*

Art. IX. *A Review of a French Translation, by MM. Vagel and Bouillon La Grange of Remer's* Police Judiciaire Pharmaco-Chimique.

Art. X. *Ordonnance Royale relative au " Codex Medicamentarius."*

We are glad, for the sake of the French, to see this arrêté of the King; it does not come sooner than it was wanted. Every stranger must have been astonished at finding the apothecaries in France without a " Pharmacopœia Gallica" to guide their operations.

SEPTEMBER.

Art. I. *Fragmens de nouvelles Recherches sur l'Origine du Sucre de Canne.*

Art. II. *Sur l'Eau de Vie de Pommee de Terre.*

Mon. Cadet thinks that from 800 pounds of potatoes about 30 of spirit of wine might be obtained by following a method which he details. This operation would cost about 36 francs and produce nearly 48.

Art. III. *Observations de Physique végétale. Epis de Blé d'une apparance métallique.*

There has been lately found under the foundation of an old house a cellar containing a quantity of ears of corn preserving

nearly the same appearance, that they have when fresh, except that the grains are completely carbonised, and possess a metallic lustre not unlike that of sulphuret of lead. The grains adhere to each other; they are particularly light, friable, and their volume a little increased. Exposed to the air, they experienced no change whatever.

The author (M. Virey) discusses the cause of this phenomenon, and tries to ascertain the epoch at which this collection of wheat was thus concealed.

The next three articles are not deserving of any particular attention.

Art. VIII. An extract from Dr. Ferriar's Medical Histories and Reflections.

Art. IX. *Eaux minérales de Nevis.*

The analysis of these mineral waters is mentioned merely to shew that it cannot be correct.

Art. X. *Lettre de Mons.* Desvaux *sur le Chouan et sur un Poivre factice.*

From an accurate examination of the botanic characters, and from analogy, the author thinks there can be no doubt that the *chouan* is the same as the *Anabasis tamariscifolia.* Mons. Desvaux takes this opportunity of giving some *éclaicrissemens* respecting the factitious pepper, which is sold in the provinces of France, and which had already been noticed by the editors of the *Journal de Pharmacie.* Mons. Desvaux has ascertained that it consists of grains of the *brassica napus,* over which a paste made of flour mixed with a little powder of cayenne pepper, or mustard seed, is carefully laid and dried. On the fabrication of this *drogue* the author gives some interesting details, obtained from one of the men who hawks it in the country. The manufactory is established at Lyons.

The two next articles are reviews of recent chemical and pharmaceutical works.

Art. XIV. *Dissertation sur l'Acide tartarique et sur sa Combinaison avec l'Acide borique, &c. Par Mons.* Thevenin.

We find nothing new to engage us to enter into the analysis of

this memoir. What the author says of the combination of the two acids in question, and the solubility imparted by the latter to the former, had been announced sometime before, by another French *Pharmacien*, in the *Journal de la Société des Pharmaciens* of Paris.

OCTOBER.

Art. I. *Essai sur une Classification des Principes immédiats des Végétaux. Par* M. Desvaux.

This is only an attempt which the author promises further to develope by other researches and observations. The author begins by establishing a difference between the immediate produces of vegetable bodies, and their immediate principles. The latter he endeavours to bring into one collective view in order to facilitate their study. The principles on which his classification is founded are next detailed; and these are followed by the classification itself. M. Devaux divides his immediate vegetable principles into three great classes, the first of which contains the *principles of vegetables* common to animals and mineral substances. This class contains *four* orders.

Or. 1st. *Oxid s* containing six species.

Or. 2nd. *Non-metallic combustibles* containing one single species.

Or. 3rd. *Salts* containing 44 species.

Or. 4th. *Water.*

In the *Second Class* we find the substances, or principles common to vegetables and animals. This contains one order only, and six genera.

The *Third Class* is destined for the *principles* proper to vegetables. It is formed of

Or. 1st. composed of carbon, hydrogene, oxygen, and azote: containing

Genus 1.	- -	Ferment.
——2.	- -	Narcotine.
——3.	- -	Crystallinite.
——4.	- -	Hematine.

Or. 2nd. composed of carbon, and hydrogene and oxygene in excess: containing the acids consisting of 15 species.

Or. 3rd. composed of substances with carbon, and hydrogene

and oxygene in the proportions proper to form water. It contains.

Genus	1.	Liquite.
———	2.	Feculite.
———	3.	Saccharinite.
———	4.	Gommite.
———	5.	Amarinite.
———	6.	Polychronite.

Each genus being subdivided into a number of species. There are two doubtful genera attached to this order.

Genus	1.	Tanin.
———	2.	Extractive.

Or. 4th. composed of carbon oxygene and hydrogen, the latter in excess: containing

Genus	1.	Gluine.
———	2.	Wax.
———	3.	Oil.
———	4.	Scilline.
———	5.	Aromite.
———	6.	Resinite.
———	7.	Resino amarinite.
———	8.	Caout-chouc.
———	9.	Camphor.
———	10.	Olivile.
———	11.	Picrotoxine.

Some of these genera being subdivided into species.

Art. II. *Lettre à Mons.* Virey *sur l'Angusture veneneuse.*

Art. III. *Déscription des Angustures du commerce de la vraie, et de veneneuse.*

In one of the late numbers of the Medical Repository a translation of a very interesting paper from a German physician, is published, in which we find all the necessary information on the subject of the false and true Angustura, with an account of the effects of the former on the human œconomy.

Art. III. is an account of some pharmaceutic manipulations performed by means of the filtre press of Mons. Real, described in a former number of this Journal.

Art. IV. Is a pharmaceutic preparation.

Art. V. *Sur lè Vin de Poules.*

What is the *Vin de poules ?* our readers will ask. Let us consult Mons. *Cadet de Gassicourt*; who tells us, *avec le plus grand serieux du monde*, that if we take a certain quantity of the excrements of hens (it must not be a cock !), dry them, and carefully separate the white portion from the rest, and next infuse two ounces of it in a *litre* of white wine, taking care to shake the bottle well containing the infusion, from time to time, and ultimately to filtre the liquid; we shall have the desired preparation.

But our readers may perhaps suggest, that this is not, properly speaking, a *vin de poules*, but rather good white wine spoiled by the *excremens de poules*. No matter; Mons. Cadet will again inform us, that if we take the trouble of swallowing two glasses full of this wine, morning and evening (though it should even create nausea,) when we experience any difficulty in the secretion of urine, we shall doubtlessly find immediate relief from it, and experience an acceleration in the general circulation. All this may be well and good, but we should prefer a cup of his *chocolat de santé*, or to masticate a dozen of his *tablettes aromatiques*.

The remaining articles of this Number are not of a nature to be analysed in this place. The last is an abstract of Sir H. Davy's paper on Flame.

JOURNALS PUBLISHED IN SWITZERLAND.

Bibliothèque des Sciences et des Arts. Geneva, (Monthly.)

SEPTEMBER.

Art. I. *On Comets.* By H. Williamson.

It is an extract from the Transactions of the Literary and Philosophical Society of New York.

Art. II. *Bemerkungen über die Blauefarbe, &c.* or, Observations on the the blue colour of milk. By Dr. Bremer.

That the milk of cows has more or less a blue tinge, and in some cases of considerable intensity, no one will deny. Dr. Bremer has had occasion to see it when churned, as blue as

indigo; and Klaproth found that the colouring matter in such cases, presents exactly the same phenomena as that substance, when treated with the various chemical reagents. Is this change of colour in the milk the effect of diseased secreting organs, or the mere consequence of a particular kind of food? The author is decidedly of the latter opinion; and to prove its accuracy, instituted some experiments; when he found that cows which were fed with sainfoin in two days secreted a milk of a remarkably fine blue tinge; while by changing their food the milk was restored to its wonted whiteness, still, the same phenomenon does not take place with all the cows similarly fed. We must therefore admit a particular disposition of the secreting organs of the animal. From the want of action of an alkaline ley on the blue colour, adhering with the utmost tenacity to the wooden vessels in which the milk in question has been long kept, Mr. Hermbstaed (who has added some notes to this paper) deduces the impossibility of any prussic acid being the cause of this singular alteration.

Art. III. relates to M. Porrett's galvanic experiments inserted in the Annals of Philosophy for July last.

Art. IV. *Leçons de Géologie*, &c. Par Delametherie. See our last Number, page 429. We differ *toto cælo* from the present reviewer,

Art. V. *Observations on the Communication of contagious Diseases.* By Dr. Hosack of the University of New York.

Art. VI. to X. are from English publications.

Art. XI. *Lettre de* M. Biot, *Membre de l'Institut, au Prof.* Pictet.

The review of M. Biot's Traité de Physique in the Bibliothéque Universelle has given rise to many explanations, and to a correspondence between the author and the reviewer. The object of the present letter is to correct an error which has occurred in a former one printed by Mons. Pictet in the same Journal respecting the principles of movement and equilibrium. By a transposition in the original copy of the former letter M. Biot was made to give the permanence of the celestial movements as a proof of the proportion between the velocities and the

forces; whereas it was his intention to assert, that those movements are simply a proof of the *vis inertiæ.*

Art. XII. *Traduction, in parte quâ, d'une Lettre aux Redacteurs de la Bibliothèque, écrite de Pise.*

The subject of this anonymous communication relates to the action of flame on combustible bodies; and to the transmission of heat. The writer asserts that he succeeded in completely melting tin, and even lead, contained in a small copper vessel, without burning, or otherwise injuring a piece of common linen cloth, which he had applied externally to the vessel, and had been exposed to the immediate contact of the flame during the whole time of the operation. Water was boiled in another vessel of brass, and the same phenomenon observed with regard to a piece of cloth exposed to the action of the flame of a candle in the same manner.

OCTOBER.

Art. I. *Astronomisches Jarhbuch,* &c. or Astronomical Ephemeris of Berlin for the year 1818, calculated and published by M. Bode, Astronomer Royal.

The nature of all these books is pretty generally known; they must all necessarily resemble each other, and can only be distinguished by more or less accuracy and skill displayed in their compilation. The present one seems to deserve the particular attention of astronomers, and contains much useful information.

Art. II. *Procédé pour l'Analyse de la Terre végétale,* in a letter from M. Schübler to Saussure, jun.

To separate the nutritive part of arable soils, the author employs crystallised carbonate of potash; the analysis would be inexact if caustic potash were employed, as the latter dissolves silex, and a considerable portion of the vegetable fibre. The solution has a brown colour, which is more or less intense, according as the soluble matter is more or less abundant. After filtering the solution, M. Schübler submits the dried,

and weighed residue to the action of fire, and thus ascertains the proportion of vegetable matter and charcoal it contains: muriatic acid is then carefully added, till no further formation of flocculent matter in the liquid is perceived. This is literally the process first employed by Professor Crome.

Art. III. *Elémens de Physiologie végétale et de Botanique, par* Brisseau Mirbel, 3 vol. &c.

See our Third Number, in which the substance of this work was given.

Art. IV. *Notice sur les Serpens de la Suisse, par M.* Wyder.

There are five species of these dangerous reptiles, which the author has examined, and which seem more or less abundant in Switzerland. These are the common viper, the *coluber fulvus*, the *coluber natrix*, the Austrian snake, and the Anguis. Their description adds nothing to the information already contained in every book of zoology.

Art V. VI. and VII. we have elsewhere noticed.

Art. VIII. *Notice des Séances de la Société Helvetique des Sciences naturelles, réunie à Berne le* 3. 4. *et* 5. *Octobre*..

The nucleus of a Society for promoting the knowledge of Natural History, was, it appears, first formed in October, 1815, at Geneva, by the late M. Gosse. Several naturalists went thither from various parts of Switzerland: the plan and regulations of the Association were drawn up, and it was finally determined, that the members should assemble every year, and for three consecutive days, in one or other of the principal towns of that country. The first meeting was held at Bern, in October, 1816. The President opened the assembly with a speech in the German language, in which he set forth the motives for establishing such an Institution, and detailed at full length the objects which the Society had in view. There were present sixty-six members from different Cantons, who, after the first day's meeting, visited the various apartments in the house of the Society, containing a fine cabinet of natural history, and a rich and extensive library, besides a con-

siderable botanic garden. Amongst the foreign members, we perceived with pleasure, the name of Sir John Sebright, Bart. M. P. who had assisted at the first meeting. A sum of 600 francs having been granted by Government to the Society, the latter decided, that it should be employed in establishing an annual prize for the best paper on natural history. We congratulate the Swiss nation, and her learned men, on this meritorious undertaking, from which so much good is likely to result to science in general.

Art. IX. X. XI. are taken from English Journals.

Art. XII. is a letter from Professor Eynard to Mons. Pictet, sending the latitude of the Observatory of Beaulieu, determined by him with the theodolite of Schek after several observations. It appears to be 46°. 26′. 57.″ 25.

NOVEMBER.

The seven first articles are from English works, or have already been before us.

Art. VIII. *Ueber das Zerspringen der Dampfmaschinen, &c.* or, On the Explosions of Steam Engines. By the Chevalier Baader.

The author, whose name must be familiar to our readers, takes pains to persuade his countrymen of Munich, that the many dangerous accidents produced by the explosions of steam engines, of which several have lately occurred both in England and America, are by no means inherent to the machine itself, but must be ascribed to the several defects in their construction, owing to pretended amelioriations introduced by ignorant persons. None of the thousands of machines, large and small, constructed by Watt, whose establishment the author has had an opportunity of examining, have ever exploded; and we should have never heard of such an accident, perhaps, if Mr. Richard Trevithick, of Cornwall, had not proposed another steam engine of quite a different construction. The condenser being done away with, he has made the steam act on the internal surfaces of the recipient, with an elasticity

equal to 6 or 8 atmospheres; and hence the danger of explosions. The Chevalier concludes his paper by casting some ridicule on the idea of employing a steam engine as a substitute for horses, in drawing carts and post-chaises.

Art. IX. *Notice of Experiments on Flame, by Sir* H. Davy.

(See our Journal, No. III.)

Art. X. *Sur la Quadrature du Cercle* (avec fig.)

We have no paper to waste on this subject.

Art. XI. *Proceedings of the Royal Academy of Sciences at Paris in September.*

(See our Journal, No. III.)

Art. XII.

The purport of the letter constituting the present article is to correct some misstatement which occurred in the memoir of Mons. Marcel de Serres of Montpellier, on the fresh water formations near that town, of which we have given an account in our review of the Bulletin des Sciences de la Société Philomathique de Paris.

Art. XIII. *List of Foreign Publications.*

Art. XIV. *Meteorological Table.*

DECEMBER.

Art. I. *D'un Instrument astronomique doublement repetiteur, et d'une Methode d'Observation qui lui est particulière. Par* D. Devecchj, *late Professor of Astronomy at Florence.*

This instrument consists in the union of the repeating circle of Borda, and the double repeating theodolite, by which the author professes to have performed with the utmost exactness all sorts of astronomical operations.

Art. II. *Commentari sopra la Storia e la Teoria dell' Ottica, by the Chevalier* Venturi.

The name of the author is advantageously known in England, through several very interesting memoirs on optics. The present is an historical sketch of the origin and progress of

that science, and as such not susceptible of being analysed in a short compass.

Art. III. *Chemische Tabellen,* or *Tableaux chimiques du Règne animal. Par le Dr.* John. *Traduites en Français par* Robinet. 1 vol. 4to.

We have mentioned somewhere in our Journal the translation of this work, which we consider as likely to prove of great service to the practical chemist, and to the medical profession in particular.

Art. IV. Extracted from the London Medico-chirurgical Transactions, and relates to the operation for artificial pupil, by Professor Maunoir of Geneva.

Art. V. *Esquisse mineralogique des Environs de la Chaussée des Géans. Par M.* B.

This is little else than a catalogue of geological and mineralogical substances observed in the course of a tour through the North of Ireland. After the very elaborate Memoir on the Geology of a part of that county, contained in the third volume of our Geological Society, the reader can scarcely expect more information in a short and meagre collection of notes on the same subject.

Art. VI. is a review of a botanical work on the medical and economical nature of the *Solani.* Not having seen the work itself, we cannot say how far the observations of the reviewer are correct.

Art. VII. *Proceedings of the Royal Academy of Sciences at Paris, for September.*

(See our Third Number.)

Art. VIII. *Lettre du Professeur Maunoir à Mons. Pictet sur un Perfectionnement introduite dans le Chalumeau de Newman.* (Brooks's.)

The improvement here suggested, with the addition by the editors, is exactly the same as that which Mr. Edwards first

proposed, and published in the Medical Repository of London. Like it, is insufficient for the purpose for which it was intended, as the gases will have lost the great advantage of being compressed, when they are made to issue from separate boxes, again to combine in a small and common reservoir.

Art. IX. *Lettre aux Rédacteurs de la Bibliothèque Universelle sur la Notation numérique.*

This Paper refers to the Xth, Article in the Number for November, relative to the quadrature of the circle, or the proportion between a circumference and its diameter. We may say the same of Article X, containing a letter from M. Shaub on the same subject.

Art. XI. *Apparition d'un Météore igné.*

On the 11th of December, 1816, at 46 minutes past five o'clock P. M., M. Stark observed, at Augsburg, a fiery meteor, resembling in light, colour, and apparent diameter, the full moon when seen through light clouds. It appeared to have a west south-west direction, and rapid. In eight seconds, from the moment of its appearance, it had reached the meridian; and in six seconds more had ceased to become visible. It seemed to drag behind it a zig-zag tail, the length of which was three times that of the diameter of the body. Next follow the enumeration of the observations made at the time, with several meteorological instruments.

Art. XII. *Meteorological Table.*

JOURNALS PUBLISHED IN FRANCE.

Journal de Physique par M. Delametherie. November, 1816.

Art. I. *Mémoire sur les nouvelles Propriétés de la Chaleur à mesure qu'elle se developpe dans sa Propagation le long des Morceaux de Verre, par* David Brewster.

Translated from the Philosophical Transactions. Part I. 1816.

Art. II. *Récherches sur la Respiration des Plantes exposées à la Lumière du Soleil, par* M. Richland.

De Saussure found, that a considerable portion of the oxygen given out by plants in day time, was derived from carbonic acid present in the atmosphere gradually decomposed by the vegetable bodies exposed to solar light; and that the carbon thus set free served to augment the volume of the plant, where no other means of subsistence existed. The inspiration of oxygene gas by plants at night, and its expiration in the day, were also two phenomena which Saussure examined with particular attention; and he deduced from his observations a confirmation of his former opinion respecting the decomposition of the carbonic acid by vegetation. M. Richland, however thinks that all these phenomena may be explained otherwise, and without having recourse to a decomposition, in other cases so difficultly effected. He thinks, that the excess of oxygen given out by plants in day time above the quantity absorbed during night, is ready formed in the plant itself, and its expiration favoured by the presence of the carbonic acid, which is in its turn absorbed to occupy the place of the oxygen. This hypothesis led him to the institution of several experiments to prove the influence of various acids, and other substances in facilitating the expiration of oxygen by vegetable bodies. We have collected, in the form of a table, the results he has obtained, assuming the mean produce of several experiments. The leaves employed were those of the *Sambucus nigra.*

Liquid Mixture.	Volume of air disengaged in inches.	purity of the air disengaged.
Spring water - - -	4.7	0.47
Water boiled for two hours -	1.5	0.34
Water + sulphuric acid - -	7.0	0 31
Water + muriatic acid - - -	20.6	0 73
Water + $\frac{1}{1000}$ muriatic acid - -	17.0	0.70
Boiled water + nitric acid - -	9 0	0.66
Water + muriatic acid in the dark -	0.0	—
Water + nitric acid - - -	17 3	0.65
Water + acetic acid - -	24 5	0.79
Water + carbonic acid, saturated at 12°	7.2	0.45
Water + carbonic acid, ditto, mixed with $\frac{1}{2}$ its quantity distilled water -	22.0	0.76
Ditto ditto mixed with $\frac{3}{4}$ of distilled water - - -	24 0	0.78
Water + ammonia - - -	0 0	—
Lime-water - - -	0.0	—
Water + carbonate of potash - -	0.0	—
Water + muriate of ammonia - -	6 5	0.51
Water + acetate of potash - -	3.5	0 30
Water + nitrate of potash - -	11.0	0 55
Water + muriate of soda - -	4.7	0 36
Water + tartrate of potash - -	16 0	0.56
Water + potash - - -	0.0	—
Water + alcohol - - -	1.2	0 21
Water + chlorine - - -	4.7	0.46
Water + $\frac{1}{1000}$ of chlorine - -	3 5	0.36

N. B. Whenever the quantity of the acid is not expressed in numbers in the above table, it is to be understood to have amounted to $\frac{1}{1000}$ of the water employed. The salts were used in the proportion of 3 drachms each; but M. Richland forgets to give the quantity of water used in the experiments. The eudiometric means employed to ascertain the purity of the air given out, were the washing it with lime water, and analysing it with sulphuret of potash.

From the above experiments M. Richland thinks he may infer, 1st. That the acids of some salts are favourable to the respiration of plants; 2dly, That, in the dark, they augment

the inspiration of the oxygene gas; and exposed to the solar light, increase the expiration of it, the plant absorbing the acid or the salt in its stead.

We are not prepared to decide on this question.

Art. III. *Suite du Supplément au Mémoire sur la Réduction des Degrés du Thermomètre de Mercure en Degrès de Chaleur réelle, par* H. Flaugergues.

(See the last Number of this Journal, page 436.)

Art. V. *Meteorological Table, by* M. Bouvard.

Art. VI. *Suite du Mémoire sur les Substances minérales dites* EN MASSE *qui entrent dans la Composition des Roches volcaniques de tous les Ages, par* L. Cordier.

The present paper contains the concluding part of M. Cordier's interesting memoir, noticed in our last Number, p. 434. At the end of the memoir we find the following important systematic arrangement of the volcanic masses.

Distribution méthodique des Substances volcaniques dites en masse.

Section I.

Feldspathic substances; *in which the particles of the feldspath are greatly predominant.*

A) unaltered.

TYPE I.*

Exclusively composed of microscopic crystals, of an equal size, adhering by their simple juxta-position, with greater or smaller spaces between them.

LEUCOSTINE.

Sub-types.

a. Leucostine (compact) *Synon.* Petrosiliceous lithoid lavas; sonorous compact felds-

* M. Cordier calls Type what M. Haüy would call ***principal modification*** of any two predominant species, and which Werner calls ***species.*** The Sub-types, therefore, in the present method, answer to the sub-species of the latter, and to the principal varieties of the former eminent mineralogist.

Sub-types.			
			path, klingstein, phonolite, volcanic hornstein.
b. Leucostine.	(scaly)	*Synon.*	A new sort, in which many of the crystals of felds-path are flat, and placed in the same direction: grau-stein of Werner?
c. ———	(granular)	——	Domite: basis of part of the thonporphyries of Auvergne, and probably of Hungary: basis of part of the trap porphyries of Humboldt.

Type II.

Composed of a puffy glass, with a mixture of microscopic crystals more or less abundant.

PUMITE.

Sub-types.			
a. Pumite	(grumous)	*Synon.*	A new sort, having a lithoid aspect.
b. ———	(heavy)	——	Pumice stone (heavy) of Spallanzani and Dolomieu.
c. ———	(light)	——	Common pumice stone: lave vitreuse pumicée of Haüy.

Type III.

Composed of massive glass, with almost always a mixture of microscopic crystals more or less abundant.

OBSIDIENNE.

Sub-types.			
a. Obsidienne	(perfect)	*Syn.*	Obsidian; vitreous uniform lava. Feldspathic glass.
b. ———	(smalloide)	——	Opaque, vitreous lava, volcanic pechstein; pechstein.
c. ———	(imperfect)	——	A new sort, having an aspect between vitreous and lithoide.

Type IV.

Composed of crystals and microscopic vitreous grains not adhering together.

SPODITE.

Sub-types.

a. Spodite (cristalliferous)	*Syn.*	White volcanic ashes.
b. ——— (semivitreous)	——	Pumice stone ashes.
c. ——— (vitreous)	——	Idem.

Type V.

Composed of vitreous grains, often mixed with crystals, both microscopic, of an unequal volume, partially terreous, feebly adhering together or imperceptibly cemented by foreign substances (altered vitreous and semi-vitreous spodite).

ALLOITE.

Sub-types.

a alloïte (friable) *b* ——— (consistent) *c* ——— (indurated)	*Syn.*	Part of the white or yellowish white tufas; pumice tufa, the pretended volcanic tripoli; the tripolean thermantides; agglutinated pumice ashes.

Type VI.

Composed of crystals often intermixed with vitreous grains, both microscopic, of a very unequal size, not inserted within each other; partly terreous; adhering very feebly or imperceptibly cemented by foreign substances (altered crystalliferous spodite).

TRASSOÏTE.

Sub-types.

a trassoïte (friable) *b* ——— (consistent) *c* ——— (indurated)	*Synon.*	Tufas of an ashy gray; trass; part of the white or yellowish white tufas; the pretended volcanic tripoli.

Type VII.

Composed, exclusively, of microscopic crystals of an equal volume, interwoven, partly terreous, admitting at times greater or smaller vacuities between them, adhering by their simple juxta-

position, or imperceptibly cemented by foreign substances (altered Leucostine).

TÉPHRINE.

Sub-types.

a Téphrine (solid)	*Syn.* Feldspathic lava, or decomposed petrosiliceous lava, decomposed klingstein, decomposed volcanic hornstein.
b ——— (friable)	—- Decomposed domite, decomposed feld-spathic lava, basis of the porphyrtrappen.
c ——— (indurated)	-— Basis of feldspathic amygdaloide lavas, basis of the thonporphyry.

TYPE VIII.

Composed of massive or puffy glass slightly rent in various places, almost always with a mixture of microscopic crystals, more or less abundant, adhering by mere ju ta-posit n, or imperceptiby cemented by foreign substances (altered obsidian and pumite).

ASCLÉRINE.

Sub-types.

a. Asclérine (solid)	*Syn.* Decomposed heavy pumice stone; decomposed imperfect obsidian.
b. ———- (friable)	-— Decomposed pumice stone, decomposed obsidian.
c. ———- (indurated)	—- Pumice stone effervescing with acid or penetrated by hydrated iron.

Section II.

Pyroxenic substances; *in which the particles of pyroxene are predominant.*

A) unaltered.

TYPE I.

Exclusively composed of microscopic crystals interwoven, of an

equal volume, adhering by their simple juxta position, leaving vacuities more or less considerable between them.

BASALT.

Sub-types.

a. Basalt (compact) *Syn.* Uniform basaltic lithoid lava; argillo-ferrugineous lava; trapp basalt; compact lava of Werner.

b. ——— (scaly) — Scaly basaltic lava of Dolomieu, in which the crystals of feldspath are flat placed in the same direction.

c. ——— (granular) — Gravelly basaltic lava of M. Faujas de St. Fond. Graustein of Werner?

TYPE II.

Composed of a puffy glass, with an almost constant mixture of microscopic crystals more or less abundant.

SCORIÆ.

Sub-types.

a. Scoriæ (grumous) *Synon.* A new sort, having the lithoid aspect, often confounded with the heavy scoriæ; porous lava of Werner?

b. ——— (heavy) — Uniform scorified lava; heavy scoria of Dolomieu.

c. ——— (light) — Uniform, scorified, or massive lava; thermantide cémentaire of Haüy; scoriæ of Werner; light scoriæ of Dolomieu.

TYPE III.

Composed of a massive glass, almost always with a mixture of microscopic crystals more or less abundant.

GALLINACE.

Sub-types.

a. Gallinace (perfect) *Synon.* A new sort; obsidian fusing

		into the black glass of Dedrée; glass with a basis of fontiform lava of Delamethérie.
b. Gallinace (smalloide)	——	A new sort, sometimes black, and sometimes of a dark red.
c. ——— (imperfect)	——	New sort forming the passage to the compact basalt.

Type IV.

Composed of crystals and microscopic grains not adhering.

CINERITE.

Sub-types.

a. Cinerite (crystalliferous)	*Syn.*	Ordinary volcanic ashes.
b. ——— (semivitreous)	——	Ditto.
c. ——— (vitreous)	——	Red volcanic ashes, or of a blackish gray colour.

B, altered.

Type V.

(*Same description as in Type V. of the First Section*) Cinerite vitreuse and semivitreuse altérées.

PEPERITE.

Sub-types.

a. Peperite (friable) *b*. ——— (consistent) *c*. ——— (indurated)	*Syn.*	Volcanic tufas of a vivid red; brown red; brown; intense grayish green; earthy pozzuolana partly friable; basis of some peperinos.

Type VI.

(*Same description as in Type VI. of Section the First*) Cinerite cristallifére altérée.

TUFAÏTE.

Sub-types.

a. Tufaïte (friable) *b*, ——— (consistent) *c*. ——— (indurated)	*Syn.*	Ordinary volcanic tufas; basis of most peperinos; friable pozzuolana; volcanic and trappean lava of Werner.

Type VII.

(*Same description as Type VII. of Section the First*) Basalte altéré.

WACKE.

Sub-types.

a. Wacke (solid) *b.* —— (friable) *c.* —— (indurated)	*Synon.*	Decomposed basalt lava ; *Wacke* of Werner.

Type VIII.

(*Same description as Type VIII. of Section the First*) scorie, ou gallinace altérées.

POZZOLITE.

Sub-types.

a. pozzolite (solid) *b.* ——— (friable) *c.* ——— (indurated)	*Syn.*	Decomposed scoriæ, capillary pozzuolanas, basis of the amygdaloïde scoriæ.

DECEMBER.

Art. I. *Suite du Mémoire sur les nouvelles Propriétés de la Chaleur à mesure qu'elle se développe, &c. Par M.* Brewster, *&c.*

(See Art. I. in Number for November.)

Art. II. *Recherches sur l'Action galvanique, par M.* Dessaignes.

The author had already shewn, by a series of experiments detailed in a memoir published in 1811 in the *Journal de Physique*, that a Voltaic pile lost entirely its electric power when exposed to a temperature +100° (212° F)— while on the contrary its action became double in intensity, when half the pile only was exposed to the said temperature; the other half remaining in the usual thermometrical state of the atmosphere. Similar results were also obtained when the whole, or only one-half, of the voltaic column was surrounded by a freezing mixture. He likewise shewed, that if two homogeneous metals were differently heated, and used to form a circle

with the limbs of a frog, muscular contractions were excited as when two dissimilar metals are employed.

M. Dessaignes now brings forward more facts in support of these results, some of which are curious: we can only find room for one or two. Heat a silver spoon throughout, and then cool it unequally, by placing one of its extremities on a mixture of ice and salt. Bring the nerves of a prepared frog in contact with the hottest, and the feet with the coolest end of the spoon: muscular contractions will be distinctly observed every time the experiment is made. Or lay hold of a prepared frog by its feet with one hand, and with the finger of the other, previously immersed in a frigoric mixture, touch the nerves of the animal; the same phenomenon of muscular contractions will be observed. Lastly, plunge the nerves of the frog in a bason full of cold and its feet in another of warm salt water; strong contractions will take place whenever we touch the water of the two vessels with the fingers of both hands at once. From these and many other interesting facts, M. Dessaignes concludes—1st. That by an even temperature, whether too high or too low, the metals lose their electromoving power. 2d. That by unequally heating an homogeneous body, the power of exerting muscular contractions in frogs, similar to that possessed by two heterogeneous bodies, is completely developed. 3d. That the electromoving power of a pair of plates, such as zinc and silver, may be entirely annihilated by heat and cold. 4th. And lastly, that when a voltaic pile is exposed to a uniform temperature of either —28° or 100°+, its electric power is destroyed.

The remaining Articles have been elsewhere noticed.

OCTOBER (*published December* 1816).

Art. I. *Notice de quelques Expériences et Vues nouvelles au Sujet de la Flamme. Par Sir* H. Davy.
(See Journal of the Institution, No. III. p. 124.)

Art. II. *Gas hydrogène arseniqué préparé d'une manière nouvelle, et dernières Expériences de M.* Gehlen *sur cet Objet.*

This note is taken from the papers left by the late M.

Gehlen, who fell a victim to the deleterious effects of the gas in question. He distilled 200 grains of arsenic with 600 grains of caustic potash, in order to observe the action of this substance on the metal. The gas which he obtained had no smell, and burned with a flame like that of hydrogene gas—being, in fact, as M. Gay Lussac properly observes in his observations on this paper, nothing but pure hydrogene gas, and not arsenicated hydrogene gas. The residue in the retort is spungy and bulky, of a reddish brown in its inferior, and blackish in its superior part. It attracts quickly the humidity of the air, and when water is thrown over it, it dissolves quickly, becomes heated, and a gas having the smell of garlic is given out. The decomposition of water takes place likewise, when instead of arsenic we employ its oxide with caustic potash nearly dessicated, and at a high temperature. There is then, as in the former instance, a considerable disengagement of hydrogen gas; and the result of this decomposition is an arseniate of potash, which may also be obtained by heating together the oxide of arsenic and carbonate of potash, fused and deprived of water. In this case the carbonic acid is given out, and one portion of the oxide is reduced to acidify the other.

The reddish brown mass observed by Gehlen in his experiments is, according to M. Gay Lussac's opinion, a mixture of arsenite and arseniuret of potash. It is not likely that any arseniate should be present; or when the oxide of arsenic acts upon potash or its carbonate, an arseniate should be formed. The arseniuret, like the alcaline phosphurets, decomposes water, and produces arseniuretted hydrogene gas. We cannot give, in the small space to which our extracts of the different articles must be confined, all the valuable observations with which M. Gay Lussac has illustrated the above short memorandum of the late M. Gehlen.

Art. III. *Suite des Récherches de M. Berzelius, &c.*

This continuation of Berzelius's memoir, of which we had occasion to speak in another part of our Journal, contains the properties of tantalum; its degrees of oxidation; its capacity

of saturation, and its chemical properties. In a fourth article we have the analysis of several minerals containing tantalum. And a fifth gives us the analysis of all the turgstates hitherto known.

Art. IV. *Sur l'Action reciproque des Pendules, et sur la Vitesse du Son dans les diverses Substances, par* M. Laplace.

We have mentioned the first part of this interesting paper in our account of the proceedings of the Royal Academy of Sciences at Paris, inserted in our present Number; and the algebraic developement of the second part, by M. Poisson, in our review of the Bulletin de la Société Philomathique, for December, 1816.

Art. V. *Aux Redacteurs des Annales de Chimie et de Physique.* Lettre de M. T. de Saussure.

This is an answer to the objections made by Gay Lussac to M. Saussure's observations on the variation of carbonic acid gas in the atmosphere. Attached to it is a reply from Gay Lussac. But having thus announced the subject of difference between these two eminent chemists, our readers cannot expect us to go any further, "*tantos animos non est componere nobis.*"

Art. VI. *The Description of a new Steam Engine by* M. Bouvier, *illustrated by a Plate.*

He thinks that the best machine of this kind would be one which should unite the advantages of a high pressure; the augmentation of force derived from the dilatation of vapour; and the simplicity resulting from the immediate production of the required movement in the apparatus. He offers the project of such a machine to the consideration of the mechanist; without presuming to say that he has completely succeeded in obtaining the object he had in view.

Art. VII. *Extrait des Séances de l'Academie Royale des Sciences, &c.*

(See our account in the present Number.)

Art. VIII. *Sur la Hauteur, la Vitesse, la Direction, et la Grandeur du Météore qui tomba pres de Weston dans le Connecticut,* 14*th December,* 1807.

Those who wish to become acquainted with the fact which forms the subject of the present article, will find it detailed at full length in the Transactions of the American Society of Arts and Sciences, Vol. III. Part II. where it was inserted by the author, M. Bowditch, in 1815.

Art. IX. *Sur l'Acier.*

Art. X. and XI. *On Flame by Mr. Sym; and on the galvanic Action in Asthmas by Dr.* Wilson, *of* Worcester.

Art. XII. is an extract from Schweiger's Journal, and relates to the difference noticed by Professor Doebereiner between animal and vegetable charcoal.

Art. XIII. announces the publication of the *Geography of Insects, by* M. Latreille.

Annales de Chimie et de Physique redigée, par MM. Gay Lussac *and* Arago.

NOVEMBER (*published January* 1817).

Art. I. *Instructions concernant les Préparations nommées Lac-lake et Lac-dye, &c. Translated from the English.*

This is taken from Dr. Bancroft's work on Colours.

Art. II. *Mémoire sur le Rapport de la Mesure appelée Pouce de Fontainier avec l'Once d'Eau romaine modern, &c. par M.* De Prony.

This paper, although full of interest, is not of a nature to be abridged, so as to prove of any advantage to our readers. It appears from this memoir that a family composed of ten individuals at Paris, consumes about 70 litres (140 lbs. +) of water; being 14 pounds of water for each person. Changing this number for one more likely to be correct, 20 lbs., M. Prony states, that the inch of water would

be equal to the produce of 20 cubic metres of that fluid, given out in four and twenty hours; and in order to find the size and figure of the orifice through which that quantity of water ought to pass in a given time, as well as the central charge and the length of the tube (*ajutage*) the author has described a highly ingenious apparatus, by means of which several very curious and illustrative experiments have been performed. The unity being thus found, he proposes it should be added to the present decimal system in France, under the denomination of *Module d'Eau.*

Art. III. *Extraits des Journaux étrangers et nationaux.*

Art. IV. *Sur la Propriété qu' a le Tartrate acide de Potasse de dissoudre un grand Nombre d'Oxides, par* M. Gay Lussac.

The fact thus announced, says the author, is known to most chemists; but sufficient attention has not been paid to this property of tartar. From the different facts observed in this case, M. Gay Lussac is inclined to consider the super tartrate of potash as acting like a simple acid; and what gives more plausibility to this mode of considering the salt in question, is this; that it dissolves a great number of oxides, even when these are insoluble in the mineral acids and the tartaric acid. Hence a new difficulty of defining acurately the properties, acidity, and alcalinity; for if we are to consider as alcalis, all bodies saturating super tartrate of potash in the same manner, it is certain that the oxides of antimony and tin, which saturate the super tartrate of potash, ought to be considered as alkalis. The tartaric acid, and the acid tartrates, present several strong analogies with the hydrocyanic acid and the hydrocyanates, in the property they have of combining more intimately by means of complex affinities. M. G. Lussac concludes with observing that the supertartrate in question, is the best known solvent of the oxides, and that it is, therefore, particularly useful in analyses.

Art. V. *Mémoire sur les Substance minerales dites* en masse, *&c. par* M. Cordier.

(See our last and present Number.)

Art. VI. *A Description of Captain Kater's new-invented Compass.*

Art. VII. *Relates to some difference of opinion between the two professors* Meinecke *and* Doebereiner, *and* M. Gay Lussac, *on the subject of the produce of vinous fermentation.* The attack made on the latter does not seem to deserve much attention.

Art. VIII. *Sur l'Elévation des Montagnes de l'Inde, par* Alexandre de Humboldt.

This is a well digested and admirably arranged compilation of all the most authentic documents, and other information respecting the elevation of the mountains of the great Indian Continent. There are some comparative observations in it on some European and the highest American ridges, so well examined by this indefatigable and eminent naturalist; and it concludes with a translation of the brief account we gave in our last Number, of the measurements of the Himalaya, taken from the 12th volume of the Asiatic Researches.

Art. IX. *Extrait des Séances de l'Academie Royale des Sciences*

(See our account in this Number.)

Art. X. XI. XII. XIII. and XIV. relate to some extracts from foreign journals, chiefly English.

DECEMBER.

(Published the 26th February, 1817.)

Art. I. *Analyse du Seigle ergoté du Bois de Boulogne près Paris, par* M. Vauquelin.

We were fortunately enabled to anticipate the editors of the Annales, in the publication of these experiments, through the kindness and liberality of their eminent author.

Art. II. *Théorie de la Chaleur, par* M. Fourier.

As the author is about to publish the great work from

which the present has been extracted; and as we shall perhaps have occasion to lay an account of it before our readers, we for the present pass over in silence this article, observing only that, from what we know of the work and the author, we promise ourselves much information as well as gratification, in the perusal of the production we announce, and which will consist of a volume in quarto, of 650 pages. To have submitted all the laws and phenomena of heat to the test of calculation, must have required considerable time and intense application.

Art. III *Note contenant quelques Expériences relatives à l'Action de l'Acide hydrochlorique* (mur. acid) *sur les Alliages d'Etain et d'Antimoine, par* M. Chaudet, *Essayeur des Monnaies.*

The unequal action of muriatic acid on tin and antimony, has long ago been observed, and proposed as an analytical means by the experimental chemist. Mons. Thenard went as far as any other on this subject, if we may judge from his observations on the combination of antimony with tin, inserted in the Annales de Chimie; but that chemist found on experiment, that when an alloy of the two metals was treated with muriatic acid, the action was extremely weak, and antimony as well as tin, was dissolved. Nor has he been able since to obtain the complete separation of the two metals by that method. Yet the solution of the problem presents a peculiar degree of interest to the analytical chemist, as the alloy in question, is become very generally useful in the arts, and is often met with. These were the reasons which led the present author to undertake the experiments detailed in this paper. It results from these, that the best mode of operation, when it is wished to assay an alloy of tin and antimony, will be the following. First ascertain whether the alloy contains lead, which may be easily done by treating a portion of it with nitric acid, and precipitate the lead (if any be present) by sulphuric acid. Next determine the quantity of antimony contained in the alloy, which may be done on a small scale, by taking five parts of the alloy, combining them with 100 parts of tin, and after laminating the whole very fine, treating it with

hydrochloric acid (*muriatic*) by means of heat. The undissolved portion indicates, with very little difference, the quantity of antimony present. This information once obtained, take 100 parts of the alloy in question; add with all due precaution, and in a crucible under charcoal, as much tin as will suffice to render the whole quantity of it to the proportion of antimony present as 20.1. This new combination being made, flatten it and laminate it very fine, cut it into small pieces, introduce it into a matras with an excess of muriatic acid, at 22° of the aerometer of Beaumé, and after two hours and half of ebullition at least, collect on a filtre the insoluble part, which represents the antimony contained in the alloy.

Art. IV. *Nouvelles Expériences sur le Developpement des Forces polarisantes, &c. par* M. Biot.

(See our account of the proceedings of the Royal Academy of Sciences at Paris, for January last.

Art. V. *Analyse des Sels de Strontiane et de quelques Mineraux, par* M. Stromeyer.

The present paper, taken from the Literary Advertiser of Göttingen, is a valuable addition to analytical chemistry. The first object of Professor Stromeyer, was that of finding the exact composition of the carbonate of strontian, as he intended to determine by it the composition of the other salts, by finding out the quantity of any acid necessary to decompose any given weight of the carbonate. His experiments gave for elements of the latter salt,

Strontian	- -	70,313 or	100,00
Carb. acid	- -	29,687	42,22
		100,000	142,22

The carbonates of strontian, whether natural or artificial, do not contain any water of crystallization, as Dr. Hope and Pelletier suspected.

If we assume 10 to be the equivalent number for oxygen, we have the following numbers for the equivalent of

Carbonate of strontian - -	92,768
Strontian - - - -	65,228
Strontium - - - -	55,228

Strontian therefore, is composed of

Strontium - -	84,669 or	100,000
Oxygene - -	15,331	18,107
	100,000	118,107

The sulphate of strontian consists of

Strontian - -	57,0 or	100,00
Sulphuric acid - -	43,0	75,44
	100,0	175,44

The nitrate of strontian is composed of

Strontian - -	49,38 or	100,00
Nitric acid - -	50,62	102,51
	100,00	202,51

The muriate of strontian contains

Strontian - -	65,585 or	100,000
Muriatic acid -	34,415	52,474
	100,000	152,474

The phosphate contains

Strontian - -	63,435	100,00
Phosphoric acid -	36,565	57,64
	100,000	157,64

The remainder of this article relates to the analyses of two new substances, the result of which has been given by Dr. Thomson, in his Annals of Philosophy for March.

Art. VI. *Examen de la Methode pour dépurer la Magnésie de la Chaux, au moyen du Carbonate neutre de Potasse, par le Professeur* Bucholz.

It having been remarked, that the carbonate of lime is like the carbonate of magnesia, soluble in an excess of its acid,

Professor Bucholz began to doubt of the accuracy of the method hitherto employed for separating these two substances. This gave rise to some new experiments, which are detailed in the present paper, and from which it results, that the process followed by most chemists, for separating the lime from magnesia, by means of a neutral carbonate of potash is correct, since a portion of the carbonate of lime remains in solution with the carbonate of magnesia. M. Doebereiner then suggests the sub-carbonate of ammonia as the best reagent in such cases. The carbonate of lime is precipitated, and the magnesia remains in solution, forming a triple combination with ammonia, from which the earth may be easily separated by ebullition.* The two earths may also be separated by precipitating them in the first instance, by means of the sub-carbonate of potash or of soda, and by boiling the precipitate with a solution of muriate of ammonia. The carbonate of magnesia dissolves entirely while that of lime remains unaltèred. During the operation, some carbonate of ammonia is evaporated, which may be collected, and being saturated with an acid of a known strength, may serve to determine the proportion of magnesia to that of lime in the substance analysed.

Art. VII. and VIII. from Thomson's Annals.

(Taken from the Annals of Philosophy, Number XLVI.)

Art. IX. *A MM. Gay Lussac et Arago, Redacteurs des Annales de Chimie et de Physique. Lettre de M. Majendie.*

" Il y a des inconvéniens à toutes choses, même à *avoir raison* dans une discussion scientifique," says M. Majendie, who we are sorry to see so much out of humour with the remarks we were induced to make upon some of his experiments in a former Number of this Journal. If we pursue the discussion, we fear

* We can assure Professor Dobereiner, that M. Vauquelin, has been in the habit of recommending the same process for many years, in his public courses of chemistry.

it may become personal, and therefore waive it altogether. We took up the question solely upon scientific grounds, and as M. Majendie promises to satisfy our desire to see new experiments upon the very important subject of his paper, our end is quite answered. Whether M. M. *avait raison* is a question, the decision of which we leave to the readers of his paper, and our criticism.

Art. X. *Extraits des Journaux.*

(See our analytical review in this Number for the month of December, of the Journal de Physique.)

Art. XI. *Extrait des Séances de l'Academie Royale des Sciences en Decembre*, 1816.

(See our account of the Proceedings of the Royal Academy in the present Number.)

Art. XII. *Resumé des Observations météorologiques de l'Année* 1816.

This is an important article, and one which may prove of much valuable comparative interest. It appears, that there have been at Paris in 1816, 167 days of rain, 26 in July only; 71 days of frost, and 13 with snow. In nine months hail fell 19 times. Ten thunder storms were observed. The wind has blown 12 days from the N., 51 from the N. E., 24 from the E., 24 from the S. E., 52 from the S., 83 from the S. W. 84 from the W., 36 from the N. W. On the 12th of October, at 3 P.M. the magnetic needle had a west declination of 22° 25′. On the 6th of the same month, at noon, the inclination measured with a needle, the poles of which had been turned to compensate the defects of equilibrium, was 68° 40′.

Bulletins de la Société Philomathique de Paris.

Art. I. *Continuation of* M. Blainville's *Account of the Hottentot Venus.*

Art. II. *Sur la Transmission du Son à travers des Corps solides, par* M. Laplace.

This paper does not admit of abridgment.

Art. IV. *Fusion des Substances reputées infusibles, &c. By Dr.* Clarke.

(See Journal of the Institution, No. III.)

Art. V. *Aperçu des Genres nouveaux formés, par M.* Henry Cassini, *dans la Famille des Synanthérées.*

We have given an account of the formation of this new family, established by the above botanist, in a preceding Number of this Journal, and shall wait to say more about it, till the publication of his work called *Synantherologie,* which he is about to publish.

Art. VI. *Expériences sur la Flamme, par* M. B. Syms.

(See Annals of Philosophy, November, 1816.)

Art. VII. *Mémoire de Géometrie aux trois Dimensions, par M.* Hachette.

We have here the exposition of a new theory for the geometrical construction of a tangent to a curve in a given point; of the radius of curvature to the same point, and of the osculating plane when the curve has a double curvature.

Journal de Pharmacie et des Sciences Accessoires, par MM. Cadet, Planche, Pelletier, Virey, &c.

NOVEMBER.

Art. I. *Observations sur la Préparation de l'Ether sulphurique, et sur les Résidus de cette Opération, par M.* Deslauriers.

In this paper there is nothing very new or interesting.

Art. II. *Sur la Manière de préparer les Eaux minérales artificielles et les Carbonates, par M.* Gehlen.

This paper contains a description of the great establishment for the preparation of aërated mineral water, and the carbonates, now existing at Vienna, where M. Gehlen saw it. It is conducted by Dr. Fierlinger, who gave the writer of the present article permission to publish an account of it in the scientific journals of Germany. The carbonic acid necessary for the different purposes of this establishment is obtained

from the fermentation of certain substances, which are renewed every morning. The gas is given out in the greatest abundance after about an hour, and continues so the whole day. The residue of the fermented liquor is then distilled, and an excellent *eau de vie* obtained. The fermenting materials consist in a finely ground portion of oats and malt, with which a *mash* is made. The mode of saturating the water with the carbonic acid thus obtained, is very simple. The gas having been received in ordinary bottles, they are slightly corked, and placed with their mouths downwards, in different ranges, in a large but, where they are kept steady by appropriate means ; solution of sub-carbonate of soda, or of other salts, is then poured into the but, and the apparatus is then left for one night and a day in a cold place. The solution, by its elevation over the bottles, exerts a degree of pressure which forces part of the liquid into the bottle through the cork slightly introduced, where it absorbs the gas and fills the bottle. The next day, all the bottles which have not been completely filled by the solution, receive the necessary addition for that purpose, with artificial mineral water already prepared, and are then quickly and perfectly corked.*

Art. III. *Suite des Mémoires de M. Chevreul sur la Saponification.*

(See our preceding Number.)

Art. IV. *Accident causé par l'Angustura, extrait d'une Note addressée à M. Planche, par le Docteur* Marc.

We have here another instance of the bad effects of the false angustura, so ably described in a paper inserted in one of the Numbers of the London Medical Repository of last year. M. Marc having taken, as he thought, a small quantity of an infusion of the true angustura, was attacked with all the alarming symptoms of a complete *trismus* ; and but for the dose of laudanum in acetic acid, which he immediately took, and which relieved him instantly, would have, perhaps, fallen a victim to the poisonous qualities of the bark.

* This way of proceeding would not satisfy the London soda water makers.

Art. V. *Examen d'une nouvelle Espéce de Quinquina, par M.* Cadet.

The Governor of Martinique sent a quantity of bark to Dr. Alibert, which has been considered as belonging to a tree of the family of the cinchona. But the description of the tree itself being wanting, it is difficult to say whether that conjecture be just or not. The specimens examined by M. Cadet did not seem to have all come from the same tree; but they were all analysed separately, and the purport of the present note is to give the result of those analyses. M. Cadet is inclined to suspect it to be a false angustura; and though he be not in a condition to affirm positively the fact, still he recommends practitioners to be on their guard in the employment of this new substance.

Art. VI. and VII. require no comment.

Art. VIII. and IX. relate to a letter from Rio Janeiro containing some articles of information on various subjects of natural history and the manufacturies of that country. A second letter gives an account of the mode of roasting cocoa in Spain.

A letter from M. Thevenin to the Editors, and their answer to it, concludes this Number. This correspondence relates to a squabble about the composition and solubility of cream of tartar, and the mode of action of boric acid on that salt.

DECEMBER, 1816.

Art. I. *Histoire naturelle et medicale de la Noix de Serpent, ou Nhandiroba, et Considérations générales sur la Famille des Cucurbitacées.*

This article is not susceptible of abridgement.

Art. II. *Recherches chirurgiques sur le Pseudo-Narcissus de L. par M.* Caventon.

The author recommends this plant to the attention of the dyers, as capable of furnishing a very fine yellow colour applicable, with ease, to silk, linen, and wool.

Art. III. *Suite de l'Extrait des Mémoires de M. Chevreul sur les Corps gras.*

(See our preceding Numbers.)

Art. IV. *Essai sur les Moyens d'extraire le plus de Principes solubles des Substances abondantes en Fecule amilacée, &c. par M.* Bertrand.

The process employed by this *pharmacien*, for making extracts, is the following: bruise the plant, root, or bark by proper means, put the coarsely pulverised produce into a strong metallic sieve, which is then plunged into distilled water. Agitate from time to time, the matter, so as to facilitate the extraction of all the soluble principles, and the precipitation of the feculæ, or resins, through the sieve. After this operation, which lasts twenty-four hours in winter, and twelve in summer, wash, by means of a watering pot, the remainder, and submit it to the action of a press. All the liquids are then collected together, and decanted by the usual method. These are next evaporated on a sand bath, in distilling vessels, and the extract obtained of a requisite consistency.

We must here conclude our extracts from this Number, which does not furnish any other article of information likely to interest the generality of our readers.

Art. XVII. Meteorological Diary for the Months of December, 1816, and January and February, 1817, kept at Earl Spencer's Seat at Althorp, in Northamptonshire. The Thermometer hangs in a north-eastern aspect, about five feet from the ground, and a foot from the wall.

METEOROLOGICAL DIARY

for December, 1816.

		Thermometer.		Barometer.		Wind.	
		Low.	High.	Morn.	Even.	Morn.	Even.
Sunday	1	32	36	30,56	30,49	NW	W
Monday	2	26	38	30,35	30,30	WSW	WNW
Tuesday	3	29	40	30,30	30,30	W	ESE
Wednesday	4	35	39,5	30,30	30,23	SE	ESE
Thursday	5	38	41	29,99	29 55	ESE	SE
Friday	6	36	39	29,45	29,42	WbS	SE
Saturday	7	32,5	36	29,39	29,48	W	WSW
Sunday	8	27,5	36	29,46	29,58	W	W
Monday	9	25	41	29,54	29,41	SE	SSE
Tuesday	10	34	43	29,50	29,11	W	WSW
Wednesday	11	35	38	29,13	29,25	WbS	WbS
Thursday	12	30	37	29,30	28,68	SW	E
Friday	13	35	37	28,90	29,04	W	WSW
Saturday	14	30	35	29,20	29,20	W	SE
Sunday	15	35	39	28,77	29,00	WSW	W
Monday	16	30	37,5	29,30	29,40	WSW	W
Tuesday	17	33	46,5	29,30	29,20	SE	WSW
Wednesday	18	33	41	29,27	29,60	WbS	NE
Thursday	19	32,5	35	30,12	30,24	NbE	N
Friday	20	21	32	30,42	30,43	NW	NNE
Saturday	21	16	29	30,33	30,11	SW	ESE
Sunday	22	13	29,5	29,99	30,04	ESE	WNW
Monday	23	20	42	29,86	29,71	WSW	SW
Tuesday	24	42	47	29,54	29,45	SW	WbS
Wednesday	25	30	39	29,68	29,64	W	SW
Thursday	26	35	49,5	29,24	32,30	WbS	W
Friday	27	32	39,5	29,33	29,38	WbS	WbS
Saturday	28	27	45	29,67	29,35	WbS	S
Sunday	29	37	42,5	29,35	29,75	W	W
Monday	30	31	36	29,89	29,70	E	ESE
Tuesday	31	36	·46	29,62	29,60	ESE	SSE

METEOROLOGICAL DIARY

for January, 1817.

		Thermometer.		Barometer.		Wind.	
		Low.	High.	Morn.	Even.	Morn.	Even.
Wednesday	1	38	47	29,44	29,30	S	S
Thursday	2	38	42,5	29,30	29,43	SW	SSW
Friday	3	32	40	29,43	29,55	SSW	WSW
Saturday	4	35	53	29,09	29,09	SSW	WSW
Sunday	5	36	41	29,69	29,60	W	W
Monday	6	33	42	29,44	29,74	W	NW
Tuesday	7	32	36	30,27	30,32	W	W
Wednesday	8	26	33	30,35	30,35	ESE	S
Thursday	9	24	33	30,44	30,49	SSE	SE
Friday	10	23	31	30,49	30,44	SW	WSW
Saturday	11	25	37,5	30,37	30,28	WSW	WbS
Sunday	12	31	38	30,09	30,00	W	WbN
Monday	13	29	37	29,70	29,49	WbS	SW
Tuesday	14	32	36	29,47	29,50	W	W
Wednesday	15	27,5	31	28,92	29,10	E	WNW
Thursday	16	16	37	29,23	28,84	SSE	SE
Friday	17	30	40	28,79	28,79	SSE	S
Saturday	18	34	42	28,98	29,00	SbW	SSE
Sunday	19	35	40	29,00	28,80	SE	ESE
Monday	20	39	47	28,70	28,70	S	WSW
Tuesday	21	28	37	29,30	29,61	W	WbS
Wednesday	22	31	49	29,52	29,67	SW	S
Thursday	23	42	52	29,70	29,65	SW	SW
Friday	24	36	48	30,00	30,08	WbN	SW
Saturday	25	48	51	30,13	30,13	SW	SW
Sunday	26	44	46	30,08	30,00	SW	SW
Monday	27	43	45	30,16	30,29	WbN	EbN
Tuesday	28	29	40	30,30	30,20	NE	NE
Wednesday	29	39	46	30,15	30,20	WbS	W
Thursday	30	39	48	30,20	30,20	W	WNW
Friday	31	41	44	30,29	30,31	NW	W

METEOROLOGICAL DIARY

for February, 1817.

		Thermometer.		Barometer.		Wind.	
		Low.	High.	Morn.	Even.	Morn.	Even.
Saturday	1	37	46	30,40	30,40	WbN	W
Sunday	2	36,5	44	30,40	30,30	NW	WNW
Monday	3	35	40	30,24	30,14	W	SW
Tuesday	4	38	45	29,80	29,55	SW	SW
Wednesday	5	35	42	29,55	29,76	W	W
Thursday	6	39	51	29,80	29,84	W	WbS
Friday	7	43	50	29,92	30,03	W	W
Saturday	8	42	48	30,08	30,03	W	W
Sunday	9	40	47	30,18	30,18	W	W
Monday	10	40	49	30,00	29,89	W	SW
Tuesday	11	33	37	29,76	29,93	NE	W
Wednesday	12	29	44	29,34	29,60	W	WNW
Thursday	13	31	50	29,70	29,59	SSE	W
Friday	14	39	42	29,39	29,60	W	W
Saturday	15	36	47	29,38	29,38	SW	W
Sunday	16	35	43	29,56	29,74	W	WbS
Monday	17	35	53	29,80	29,84	WbS	W
Tuesday	18	36	53	29,90	29,78	W	SW
Wednesday	19	32,5	54	30,03	29,06	W	SE
Thursday	20	37	51	26,69	30,30	SW	S
Friday	21	33	43	29,36	29,30	SW	W
Saturday	22	34	44,5	29,46	29,68	W	WNW
Sunday	23	36	48,5	29,80	29,56	WbS	SW
Monday	24	39	39	29,60	29,79	W	W
Tuesday	25	40	52	29,84	29,78	W	W
Wednesday	26	40	45	29,55	29,65	W	W
Thursday	27	42	47	29,40	29,60	W	WNW
Friday	28	40	52	29,70	29,70	WbS	W

LIST OF THE MEMBERS

OF

THE ROYAL INSTITUTION.

1816.

His Sacred Majesty King GEORGE III. Patron.

HONORARY MEMBERS.

His Royal Highness GEORGE Prince Regent.

His Royal Highness ADOLPHUS FREDERICK, Duke of Cambridge.

His Majesty MAXIMILIAN, King of BAVARIA.

His Imperial Highness, the Grand Duke NICHOLAS of Russia.

His Excellency the Prince of CASTELCICALA, Minister Plenipotentiory of His Sicilian Majesty, &c. &c. &c. &c.

MARC AUGUSTE PICTET, Professor of Natural Philosophy at Geneva.

Rev. ADRIEN QUINTIN BUÉE, of Paris.

Professor MORICHINI, of the College of Sapienze of Rome.

Professor KLAPROTH, of Berlin.

Le CONSEILLER DE LA RIVE, of Geneva.

Il PADRE MONTICELLI, of Naples.

M. DE SAUSSURE, of Geneva.

Il CAVALIER SEMENTINI, Professor of Chemistry of Naples.

Il CONTE J.G. BARDE, Director of the Museum at Florence.

Le BARON JACQUIN, of Vienna.

Monsieur CUVIER, F. R. S. and Sec. Royal Inst. of France.

Professor DECANDOLLE, of Geneva.

Professor VAUQUELIN, of Paris.

Il CONTE VOLTA, of Como.

Baron LEOPOLD VON BUCH, of Berlin, Chamberlain to His Majesty the King of Prussia.

Professor JENS ESMARK, of Christiania.

Professor VIVIANI, of Genoa.

President, Earl SPENCER, K. G. F. R. S. and F. A. S.
Treasurer, Scrope Bernard Morland, Esq. M. P. LL. D.
Secretary, Thomas Harrison, Esq. A. M. F. R. S.

MANAGERS.

Marquis of LANSDOWNE, LL.D. F. R. S. V. P.
Earl of WINCHILSEA and NOTTINGHAM, K. G. F. R. S. &c. V. P.
Earl of MORTON, K. T. F. R. S. and F. A. S. V. P.
Right Hon. Sir John Nicholl, M. P. LL.D. F. R. S. and F. A. S. V. P.
Sir J. Cox Hippisley, Bart. M. P. LL. D. F. R. S.
James Peter Auriol, Esq. F. R. S. V. P.
John Frederick Daniell, Esq. F. R. S.
Sir Humphry Davy, LL. D. F. R. S. &c. &c. V. P.
George Duckett, Esq. F. R. S. and F. A. S.
Charles Hatchett, Esq. F. R. S. and F. A. S.
Daniel Moore, Esq. F. R. S. F. A. S. and F. L. S.
John Sanders, Esq. F. A. S.
Thomas Snodgrass, Esq.
Samuel Solly, Esq. F. R. S.
William Watson, Esq. F. R. S.

VISITORS.

Duke of SOMERSET, F. R. S.
Marquis of STAFFORD, K. G.
Earl of DARNLEY, F. R. S.
Lord HOLLAND, F. R. S.
Sir John Thomas Stanley, Bart. F. R. S. and F. A. S.
George Aust, Esq. F. R. S. and F. A. S,
Rev. Charles Burney, D. D. F. R. S. and F. A. S.
William Hasledine Pepys, Esq. F. R. S.
Sir Christopher Hawkins, Bart.
Gibbes Walker Jordan, Esq. A. M. F. R. S.
William Morgan, Esq. F. R. S.
Charles Pieschell, Esq.
Peter Mark Roget, M. D. F. R. S.
Richard Horsman Solly, Esq. A. M. F. R. S. and F. A. S.
Lieut. General William Thornton, M. P.

Members with a ⊙ before their Names, have subscribed to the Benefaction Fund of the Institution.

T before the Name of a Member, denotes that he has purchased one or more transferable Tickets for the Lectures.

Lord Ashburton
Col. Alexander Allan, M. P.
⊙ William Allen, Esq.
⊙ John Julius Angerstein, Esq.
⊙ Sir Edmund Antrobus, Bart.
⊙ Alexander Apsley, Esq.
Samuel James Arnold, Esq.
William Atkinson, Esq.
⊙ James Peter Auriol, Esq. F. R. S.
⊙ George Aust, Esq. F.R.S. and F.A.S.
William Ayrton, Esq.

Duke of Bedford, F. A. S.
⊙ Earl of Bessborough.
Earl of Breadalbane, F. R. S.
⊙ Earl of Bridgwater, F.R.S.&F.A.S.
Viscount Bulkeley.
Lord Braybrooke, F. A. S.
Earl Brownlow, F. R. S. and F. A. S.
Right Hon. Sir Joseph Banks, Bart. G. C. B. P. R. S. and F. A. S.
Hon. Bartholomew Bouverie, M. P.
⊙ Sir Thomas Bernard, Bart. LL. D.
⊙ Sir Charles William Rous Boughton, Bart. F. R. S.
Sir Richard Brooke de Capell Brooke, Bart. F. R. S
Sir Frederick Baker, Bart. F. R. S.
⊙ Sir Gilbert Blane, Bart. M.D. F.R.S.
Sir Samuel Bentham.
William Babington, M. D. F. R. S.
⊙ John Baker, Esq. F.R.S. and F.L.S.
William Baker, Jun. Esq.
John Balfour, Esq.
Rev. John Banks, B. D. F. A. S.
⊙ Charles Baratty, Esq. F. A. S.
⊙ Robert Barclay, Esq. F. L. S.
⊙ Richard Barker, Esq.
⊙ George Basevi, Esq.
⊙ John Bate, Esq.
⊙ Robert Batty, M. D. F. L. S.
Mrs. Beaumont.
Charles Beazley, Esq. F. A. S.
Thomas Tyringham Bernard, Esq.
⊙ Robert Bingley, Esq. F. R. S.
William Henry Blaauw, Esq.
⊙ William Blake, Esq. A. M. F. R. S.
⊙ Ralph Blegborough, M. D.
⊙ Samuel Boddington, Esq.
Thomas Boddington, Esq.
⊙ Matthew Robinson Boulton, Esq.
Charles Henry Bouverie, Esq.
Joseph Bradney, Esq.
William Thomas Brande, Esq. *Sec.* R. S. *Lond.* F. R. S. *Edin. Prof. Chem.*
Timothy Brent, Esq.
William Bridgman, Esq. F. L. S.
⊙ Charles Broderip, Esq.
⊙ Benjamin Collins Brodie, Esq. F.R.S.
James Brogden, Esq. M. P.
Patrick Crauford Bruce, Esq.
William Bruere, Esq.
Alexander P. Buchan, M. D. F. L. S.
Rowland Burdon, Esq.
⊙ Rev Charles Burney, D.D. F.R.S. and F. A. S.
⊙ Rev. Charles Parr Burney, A. M.
Sir William Burroughs, Bart.
William Bushby, Esq.
William Busk, Esq.
John Buller, Esq. F. A. S.
Charles Butler, Esq. F. A. S.
John Buxton, Esq.

Earl of Chichester, F. R. S.
Earl Cowper.
Lord Bishop of Clogher, F. A. S.
⊙ Lord Carrington, F. R. S.
Lord George Augustus Henry Cavendish, M. P.

⊙ Hon. Hugh Clifford.
⊙ Right Hon. Reginald Pole Carew, M.P. F. R. S. and F. A. S.
Sir Thomas Clarges, Bart.
Sir Simon Haughton Clark, Bart.
Henry Thomas Colebrooke, Esq.
⊙ Sir Nathaniel Conant.
⊙ John Hutton Cooper, Esq. F. A. S.
Richard Clark, Esq. *Chamberlain of London*, F. A. S.
⊙ Benjamin Bond Cabbell, Esq.
⊙ Thomas Calverly, Esq.
Thomas William Carr, Esq.
Samuel Castell, Esq.
John Chamier, Esq.
Mrs. Elizabeth Chaplin.
Richard Chenevix, Esq. F. R. S.
⊙ Charles Madryll Cheere, Esq.
⊙ Thomas Chevalier, Esq.
John George Children, Esq. F. R. S. and F. L. S.
⊙ Laugham Christie, Esq.
Samuel Pepys Cockerell, Esq.
Richard Collins, Esq.
⊙ Thomas Collins, Esq.
Oliver Colt, Esq.
Henry Cooke, Esq.
⊙ Thomas Coutts, Esq.
Samuel Crompton, Esq
⊙ James Curry, M. D. F. A. S.

⊙ Duke of Devonshire.
⊙ Earl of Darnley, F. R. S.
Earl Digby.
⊙ The Honourable the Lord Bishop of Durham.
⊙ Lord Dundas, F. R. S. and F. A. S.
⊙ Sir John Brewer Davis.
T ⊙ Sir Humphry Davy, LL.D. F.R.S. *Lond.* and *Edin.* M. R. I. A. *Hon. Prof. Chem.* R. I.
Sir George William Denys, Bart. M. P.
William Dance, Esq.
Henry Dance, Esq.
George Dance, Esq.
John Frederick Daniell, Esq. F. R. S.
Edward Robert Daniell, Esq.
Alexander Davison, Esq.

⊙ Richard Davenport, Esq.
⊙ Thomas Davy, Esq.
William Dawson, Esq.
Thomas Day, Esq.
John Dearman, Esq.
Richard Debaufre, Esq.
Miss Dehany.
Joseph Delafield, junior, Esq.
⊙ Charles Dickenson, Esq. F.R.S. and F. A. S.
Thomas Dimsdale, Esq.
John Dingwall, Esq.
⊙ John Disney, Esq. F. H. S.
Capt. Francis Drummond.
James Drummond, Esq.
Richard Duppa, Esq. LL.B. and F. A. S.
James Du Pré, Esq.
T ⊙ G. Duckett, Esq. F. R. S. and F.A.S.

Marquis of Exeter.
⊙ Earl of Egremont, F.R.S. & F.A.S.
Lord Erskine, F. R. S.
Sir Henry C. Englefield, Bart. F. R. S. *Lond.* and *Edin.* V. P. S. A.
Sir John Eamer.
⊙ Hugh Edwards, Esq.
John Ellis, Esq. F. L. S.
John Esdaile, Esq.

Major-General the Hon. T. W. Fermor, F. R. S. and F. A. S.
James Peter Fallofield, Esq.
Farrar Grove Spurgeon Farrar, Esq.
John Nicholas Fazakerley, Esq. M. P.
Nathaniel Fenn, Esq. F. R. S.
Robert Ferguson, Esq. F. R. S.
Edward Fletcher, Esq.
⊙ Rev. Edward Forster, A.M. F.R.S. and F. A. S.
⊙ John Forster, Esq.
James Franck, M. D.
James Fraser, Esq.
⊙ Francis Freeling, Esq. F. A. S.
⊙ John Fuller, Esq.

Earl Grosvenor.
⊙ Lord Grenville, *Canc. Univ. Oxon.*
Mrs. Gautier.

⊙ Davies Giddy, Esq. M. P. F. R. S. and F. L. S.
Peter Giles, Esq.
⊙ Daniel Giles, Esq.
Philip Lake Godsal, Esq.
⊙ George Trenchard Goodenough, Esq. F. R. S.
⊙ Henry Goodwyn, Esq.
Lt. Col. Thomas William Gordon.
Standford Graham, Esq.
⊙ Henry Grant, Esq.
⊙ Robert Greenhill, Esq. M. P.
Francis Gregor, Esq.
Joseph Grote, Esq.
⊙ John Guillemard, Esq. F. R. S.
James Fayting Gyles, Esq. A. M.

⊙ Earl of Hardwicke, K. G. LL. D. F. R. S. and F. A. S.
Earl of Harewood, F. A. S.
Lord Holland, F. R. S.
⊙ Lord Henniker, M.P. LL.D. F.R.S. and F. A. S.
Sir James Hall, Bart. F. R. S.
Sir Edmund Craddock Hartopp, Bart.
Sir Robert Bateson Harvey, Bart.
⊙ Lt. Gen. Sir Charles Hastings, Bart.
⊙ Sir J. Cox Hippisley, Bart. M. P. LL.D F. R. S. and F. A. S.
⊙ Sir Benjamin Hobhouse, Bart. M.P. F. R. S. and F. A. S.
Sir Christopher Hawkins, Bart.
⊙ Sir Everard Home, Bart. F.R.S. and F. A. S.
William Haldimand, Esq.
John Hale, Esq.
⊙ Benjamin Hall, Esq. M. P. F. R. S.
T ⊙ John Hall, Esq.
William Hamilton, Esq. F. R. S. and F. A. S.
Thomas Harris, Esq.
Benjamin Harrison, F. A. S.
⊙ Thomas Harrison, Esq. A.M. F.R.S. *Commis. Univ. Cantab.*
Francis Hartwell, Esq.
⊙ Thomas Harvey, Esq.
Joseph Haskings, Esq.
⊙ C. Hatchett, Esq. F.R.S. and F.A.S.

Henry Arthur Herbert, Esq.
Henry Hinckley, Esq.
⊙ Charles Hoare, Esq. F. A. S.
⊙ Henry Hoare, Esq, F. A. S.
⊙ Henry Hugh Hoare, Esq. F.R.S. and F. A. S.
⊙ Prince Hoare, Esq.
⊙ Robert Holford, Esq. F. R. S.
⊙ Charles Holford, Esq.
⊙ Henry Holland, Esq. A. M.
⊙ T. Hope, Esq. F. R. S. and F. A. S.
Henry Philip Hope, Esq.
John Hornby, Esq.
Leonard Horner, Esq.
Miss Euphemia Jane Hunter.
Joseph Hume, Esq.
Joseph Hurlock Esq. F. L. S.
Benjamin Hyett, Esq. F.R.S. and F.A.S.

Christopher Idle, Esq.
Elijah Barwell Impey, Esq.
⊙ Daniel Ince, Esq.

John Jacob, Esq.
⊙ Thomas Jeans, Esq.
Robert Jenner, Esq.
Mrs. Elizabeth Jones.
T ⊙ Gibbes W. Jordan, Esq. A.M. F.R.S.

Lord Kinnaird.
Lord Keith, G. C. B. F. R. S.
⊙ Robert Keate, Esq.
Samuel Kenyon, Esq.
John Kingston, jun. Esq.
⊙ Hon. Douglas Kinnaird.
Colonel William Kirkpatrick.
Charles Knyvett, jun. Esq.
Major General Kyd.

⊙ Marquis of Lansdowne, LL.D. F.R.S.
David Lance, Esq.
Charles Lane, Esq. F. L. S.
James Laird, M. D.
Edward Lee, Esq.
⊙ Thomas Lewis, Esq.
⊙ John Engleberts Liebenrood, Esq.
Emanuel Baruh Lousada, Esq.
Wilson Lowry, Esq. F. R. S.

John William Lubbock, Esq.
William Luxmore, Esq.

⊙ Earl of Morton, K. T. F. R. S. and F. A. S.
Earl of Mansfield, F.R.S. and F.A. S.
Earl of Morley, F. R. S.
Earl of Mountnorris, F.R.S. F.A.S. and F. L. S.
Lord Macdonald.
⊙ Hon. Edward Monckton.
Sir John Macpherson, Bart. F. A. S.
Sir Oswald Mosely, Bart. F. R. S. and F. A. S.
John Mac Arthur, LL. D.
John Macnamara, Esq.
Neill Malcolm, Esq.
⊙ William Manning, Esq.
⊙ Alexander Marcet, M D. F. R. S.
William Marsden, Esq. LL. D. V.P.R.S. and F. A. S.
John Martineau, Esq.
Christopher G. Marwade, Esq.
Thomas James Mathias, Esq. A. M. F. R. S. and F. A. S.
Samuel Mellish, Esq.
George Meredith, Esq. F. A. S.
⊙ Js. Meyrick, Esq. F.R.S. and F.A.S.
⊙ William Mitford, Esq.
⊙ Daniel Moore, Esq. F. R. S. F. A. S. and F. L. S.
George Moore, Esq.
William Moore, M. D.
William Morgan, Esq. F. R. S.
Charles Morgan Robinson Morgan, Esq. M. P.
Alexander Morison, M. D.
⊙ Scrope Bernard Morland, Esq. M. P. LL. D.
T ⊙ Francis Bernard Morland, Esq.
⊙ William Morley, jun. Esq.
⊙ James Moss, Esq.
⊙ George Moubray, Esq.
William Mount, Esq.
⊙ Thomas Murdoch, Esq. F. R. S. and F. A. S.

T ⊙ Rt. Hon. Sir John Nicholl, M. P. LL.D. F. R. S. and F. A. S.
⊙ John Nesbitt, Esq.
Charles Dalston Nevinson, M. D.
Thomas Nixon, Esq.
Noel Gerard Noel, Esq.
Peter Nouaille, Esq. F. L. S.
Admiral Charles Edmund Nugent.

⊙ Thomas Oliver, Esq.

Earl of Pomfret.
⊙ Viscount Palmerston, M. P.
Sir Lawrence Palk, Bart. LL. D.
Edward Parry, Esq.
⊙ Major Charles Pasley.
⊙ Archibald Paxton, Esq.
Major Gen. Sir Warren Peacocke.
⊙ Rev. William Pearson.
John Pearson, Esq. F. R. S.
⊙ John Penn, Esq. LL. D.
⊙ William Hasledine Pepys, Esq. F. R. S
⊙ James Perry, Esq.
John Perry, Esq.
Philip Perry, Esq.
T ⊙ Louis Hayes Petit, Esq. A. M. F. R. S. F. A. S. and F. L. S.
⊙ Rev. William Joseph George Philips, A. M.
⊙ Charles Pieschell, Esq.
⊙ Charles Pilgrim, Esq.
Thomas Pitt, Esq. F. A. S.
William Morton Pitt, Esq. M.P. F.R.S.
Richard Chicheley Plowden, Esq.
John Pond, Esq. Astron. Roy, F. R. S.
Robert Pott, Esq.
George Powney, Esq.
⊙ Samuel Prado, Esq.
⊙ Edward Protheroe, Esq. M. P.
⊙ William Price, Esq.

Sir John Buchanan Riddell, Bart.
⊙ Rev. Thomas Rackett, M.A. F.R.S. F. A. S. and F. L. S.
⊙ George Ranking, Esq.
⊙ Matthew Raper, Esq. F. R. S. and V. P. A. S.
Joshua Reeves, Esq.
John Reeves, Esq. F. R. S. and F.A.S
John Rennie, Esq. F. R. S. *Lond.* and *Edin.* F. A. S. and F. L. S. M. R. I. A

John Gibbs Ridout, Esq. F. L. S.
⊙ Rev. John Robinson.
⊙ John Peter Robinson, Esq.
⊙ Peter Mark Roget. M. D. F. R. S.
Thomas Rowcroft, Esq.
T Daniel Henry Rucker, Esq.

⊙ Duke of Somerset, F. R. S.
⊙ Marquis of Stafford, K. G.
T ⊙ Earl Spencer, K. G. F. R. S. and F. A. S.
⊙ Earl of Selkirk, F. R. S.
Right Hon. John Sullivan, M. P.
Hon. John Winfield Stratford.
Sir Mark Masterman Sykes, Bart. M.P. F. A. S.
Sir John Sinclair, Bart. LL.D. F. R. S and F. A. S.
⊙ Sir John Thomas Stanley, Bart. F. R. S. and F. A. S.
Sir George Thomas Staunton, Bart. F. R. S. and F. L. S.
Sir John Saunders Sebright, Bart. M.P.
Joseph Sabine, Esq. F. R. S. F. A. S. and F. L. S.
⊙ Samuel Sanders, jun. Esq.
⊙ John Sanders, Esq F. A. S.
John Sanderson, Esq.
Alexander Saunderson, Esq.
T William Salmond, Esq.
Peter Schmidtmeyer, Esq.
⊙ Claude Scott, Esq.
David Scott, Esq.
⊙ Samuel Seawell, Esq.
William Simons, Esq.
John Skottowe, Esq.
Rev. W. Boulthy Sleath, D. D. F. A. S.
⊙ Samuel Smith, Esq. M. P.
George Smith, Esq. M. P.
Benjamin Smith, Esq.
James Smithson, Esq. F. R. S.
⊙ Thomas Snodgrass, Esq.
⊙ John Soane, Esq. F. A. S.
⊙ Samuel Solly, Esq. F. R. S.
⊙ Samuel Reynolds Solly, Esq. A. M. F. A. S.
⊙ Richard Horsman Solly, Esq. A.M. F. R. S. and F. A. S.
⊙ William Sotheby, Esq. F. R. S. and F. A. S
⊙ James Stodart, Esq.
William Stodart, Esq.
James Strange, Esq
Alexander Stephens, Esq.
⊙ Edward Stracey, Esq. F. A. S.
John Symmons, Esq. F. R. S. F. A. S. and F. L. S.

Lord Teignmouth.
Robert Taylor, Esq.
⊙ Giles Templeman, Esq.
Garnet Terry, Esq.
William Terry, Esq.
⊙ John Thomson, Esq.
⊙ Richard Thomson, Esq.
Robert Thornton, Esq. M. P. F. A. S.
⊙ Sam. Thornton, Esq. M. P. F. A. S.
⊙ Lieut. Gen. W. Thornton, M. P.
Robert Morgan Tighe, Esq.
Miss W. B. Trail.
John Hinton Tritton, Esq.
James Trotter, Esq.
Samuel Turner, Esq.
John Frewen Turner, Esq.
Charles Hampden Turner, Esq.

Thomas Richard Underwood, Esq.

⊙ Anthony Barto Vallé, Esq.
Joseph Fitzwilliam Vandercom, Esq.
⊙ William Vaughan, Esq.
⊙ Peter Vere, Esq. F. A. S.

⊙ Earl of Winchilsea and Nottingham, K. G. F. R. S. and F. A. S.
⊙ Right Hon. Sir J. Borlase Warren, Bart. G. C. B.
Right Hon. William Wickham.
Hon. James Stuart Wortley.
Sir Mark Wood, Bart, M. P. F. A. S.
Sir Watkins Williams Wynne, Bart. M.P.
⊙ John Walker, Esq. F. R. S. F. A. S. and F. L. S.
Joseph Lyons Walrond, Esq.
⊙ H. Warburton, Esq. A. M. F. R. S.
⊙ Robert Ward, Esq.

⊙ Samuel Ware, Esq.
⊙ Martin Ware, Esq.
⊙ James Warre, Esq.
Thomas Warre, Esq.
⊙ John Warren, Esq.
Pelham Warren, M. D.
George Watlington, Esq.
T ⊙ William Watson, Esq. F. R. S.
⊙ James Watt, Esq.
Frederick Webb, Esq.
⊙ Josiah Wedgwood, Esq.
Walter Weldon, Esq.
Rev. Thomas White.
John Wiggin, Esq.
William Wilberforce, Esq. M. .
Roger Wilbraham, Esq. F. R. S. and F. A. S.
Glocester Wilson, Esq. F. R. S.
⊙ W. Hyde Wollaston, M. D. F. R. S.
⊙ Edward Wood, Esq.
Rev. Basil Woodd.
⊙ Nathaniel Wright, Esq.
Mrs. Elizabeth Wright.
William Wynch, Esq.

Lord Yarborough, F.R.S. and F.A.S.
Sir William Laurence Young, Bart.

The following Persons have paid their Contributions as Members, but have not been presented at a General Monthly Meeting for Admission.

The Lord Bishop of St. David's.
Lord Webb Seymour, F. R. S. *Lond.* and *Edin.* F. L. S.
Rear Admiral Sir Edward Codrington, K. C. B.
Hon. J. W. Ward.
⊙ James Alexander, Esq.
James Broadwood, Esq.
William Rickson Beecher, Esq.
Richard Hart Davis, Esq. M. P. F.R.S.
Andrew Gregory Johnstone, Esq.
Joseph Smith, Esq.
William Walcot, Esq.
George Wilbraham, Esq.
Thomas Brandam, Esq.
John George Seppings, Esq.
Thomas Hoblyn, Esq.
Frederick Hodgson, Esq.
Anthony Bertolacci, Esq.
Samuel Parkes, Esq.
Capt. W. C. Holloway.
Samuel P. Wright, Esq.

A List of Books presented to the Library of the Royal Institution, in the year 1816.

1816.		Donors.
Jan. 14.	A Treatise on the Valuation of Annuities and Assurances on Lives and Survivorships, 2 vol. 8vo.	Joshua Milne, Esq.
	The Barrington School, 3d edition, 8vo.	Sir T. Bernard, Bart. M. R. I.
22.	A Statement of the early Symptoms which lead to Water on the Brain, 8vo.	Dr. Yeats.
	On the Fire Damp of Coal Mines, 8vo.	Sir H. Davy, F. R. S. V. P. R. S. &c.
Feb. 18.	A Treatise on the Mineral Waters of Gilsland,	W. R. Clanny, M. D. M. R. I. A.
	Letters on Public House licensing.	Barber Beaumont, Esq.
26.	Catalogue of British Specimens in the Geological Collection of the Royal Institution, 8vo.	W. T. Brande, Esq. Prof. of Chem. R. I. and Sec. R. S.
	Catalogue des Livres de M. Le Comte de Mac Carthy, 2 vol. 8vo.	Earl Spencer, President of the R. I.
	Trial between Moore and Adam for an Assault at Alicant in Spain, 8vo.	Thomas Moore, Esq.

1816.		
Mar. 18.	Further Proceedings of the Honourable House of Assembly of Jamaica relative to the Bill for preventing the unlawful Importation of Slaves in the British Colonies,	George Hibbert, Esq.
	Copies of a Letter containing Queries respecting the State of the Silver and Copper Coins in the Island of Barbadoes, 8vo.	G. W. Jordan, Esq. F.R.S. and M. R. I.
April 8.	Catalogue of the Books and Manuscripts in the Library of the Society of Antiquaries, 4to.	The Society of Antiquaries.
	Remarks on the Pharmacopœia Londinensis,	Mr. Richard Phillips.
	A Chinese Poem, with a Translation and Notes,	The Rev. Steph. Weston, F. R. S.
	Epitome of a Scheme of Finance,	Patrick Colquhoun, Esq.
24.	Vol. XXXIII. of the Transactions of the Society of Arts, Manufactures, and Commerce, 8vo.	The Society of Arts, &c.
	An Enquiry into the Literary and Political Character of King James I. 8vo.	J. D'Israeli, Esq.
	An Introduction to Geology, by Robert Bakewell, 2d edition, 8vo.	Mr. J. Harding.
	Three Familiar Lectures on Craniological Phisiognomy, 8vo.	The Author.
May 13.	The Principles of Population and Production, as they are affected by the Progress of Society; with a View to moral and political Consequences, 8vo.	John Weyland, jun. Esq. F. R. S.
20.	Remedies proposed for the Relief of our present Embarrassments,	John Symmons, Esq. F. R. S. and M. R. I.
	Bertram; a Poetical Tale in Four Cantos, 12mo.	Sir Eger. Brydges, Bart.
June 10.	Edda Rhythmica seu antiquior, vulgo Sæmundina dicta, 4to.	Sam. Solly, Esq. F. R. S. and M. R. I.
July 1.	Mr. Basil Montagu's Selection of Opinions upon the Punishment of Death, 3 vol. 8vo.	Society for the Diffusion of Knowledge respecting the Punishment of Death.
8.	Martini Lutheri Opera omnia, 7 vol. folio. Philippi Melancthonis Opera omnia, 4 vol. folio. Joannis Hus, et Hieronymi Pragensis Historia et Monumenta, 2 vol. folio,	Earl Spencer, President of the Royal Inst.
	Theophrasti Eresii Historia Plantarum, Gr. 2 vol. 8vo.	John Stackhouse, Esq. F. L. S.
	Spurinna; or the Comforts of Old Age, 8vo.	Sir Thos. Bernard, Bart. M. R. I.
	An Essay on the Construction of a Turnpike Gate,	Thomas N. Parker, Esq.
Sept. 8.	Conversations on Political Economy, in which the Elements of that Science are familiarly explained.	The Author.
	An Analysis of the Mineral Water of Tunbridge Wells,	Dr. Charles Scudamore.
Oct. 10.	An Address delivered to the Inhabitants of New Lanark on January 1, 1816.	Mr. Robert Owen, of Lanark.
	A New View of Society; or, Essays on the Formation of the Human Character, 8vo.	
	The Colonial Journal, No. II.	The Publishers.
Dec. 2.	A Grammar of the German Language, 8vo.	George Henry Noehden, LL. D.
	Transactions of the Geological Society, Vol. II. and III.	The Geological Society.
	Augusteum; Dresdens antike Denkmäler enthaltend; Herausgegeben von W. G. Becker, folio,	Samuel Solly, Esq.
Dec. 12.	An Account of the Visit of His Royal Highness the Prince Regent, with their Imperial and Royal Majesties the Emperor of all the Russias and the King of Prussia, to the Corporation of London, in June 1814; and also the Entertainment to his Grace the Duke of Wellington, 9th July 1814, folio,	The Corporation of London.
	Philosophical Transactions for 1816, 2 parts,	The Royal Society.
	On the Lines that divide each semidiurnal Arc into Six equal Parts, 4to.	W. A. Cadell, Esq. F. R. S. Lond. and Edin.
	The Repository of the Arts, for 1816,	Mr. Akermann, the Publisher.
	European Magazine, for 1816,	Mr. Asperne, the Publisher.

List of Donations to the Mineralogical and Geological Collection, in 1816.

PRESENTS.	Donors.
Specimens of volcanic minerals from Vesuvius,	Sir H. Davy.
A series of specimens from the Isle of Arran, &c.	H.M.Da Costa, Esq.
A series of specimens illustrating the geology of Cornwall, Devonshire, and the Western Counties in general,	J. F. Daniell, Esq. and W. T. Brande, Esq.
Ditto from North and South Wales,	Ditto, Ditto.
Ditto from several parts of Scotland,	Ditto, Ditto.
Ditto north of Ireland,	Ditto, Ditto.
Geological specimens from Cumberland and Westmoreland,	T. Allan, Esq.
Green oxide of uranium from Cornwall,	Mr. Mawe.
A series of Derbyshire toadstones,	Ditto.
Wavellite from Barnstaple,	Ditto.
Specimens of black sulphuret of copper, of carbonate of lead, and of oxide of tin from Cornwall,	W. T. Brande, Esq.
Various specimens of polished marble from Shropshire,	W. Porden, Esq.
Materials used in the manufacture of pottery,	J. Wedgwood, Esq.
Specimens of the coal strata of Northumberland,	H. G. Horn, Esq.
Specimens of chromate of iron from Norway,	Dr. Esmark.

The following Donations have also been received for the purchase of Minerals;

Daniel Moore, Esq. 21*l*.
J. Frederic Daniell, Esq. 21*l*.
W. T. Brande, Esq. 21*l*.
J. Sanders, Esq. 10*l*. 10*s*.
A. Copland, Esq. 21*l*.

The Descriptive Catalogue of the Geological Collection may be had at the Institution, and at Messrs. Longmans, Paternoster-row.

Select List of New Publications, from July, 1816, *to the 20th of March,* 1817.

Natural History.

General Zoology; or Systematic Natural History, commenced by the late George Shaw, M. D. Vol. IX. in two parts. By James Francis Stephens, F. L. S. 8vo. 2l. 12s. 6d. royal paper, 3l. 16s.

A Treatise on Greyhounds, with Observations on their Treatment and Disorders. 8vo. 5s.

A History of the Earth and Animated Nature. By Oliver Goldsmith; illustrated with copper plates. With Corrections and Additions, by W. Turton, M. D. F. L S. 6 vols. 8vo. 3l.

An Essay on Human Hair. By Alexander Rowlandson, 8vo. 5s.

Appendix to the first edition of Kirby and Spence's Insects; comprising the additional matter inserted in the second edition, 8vo. 1s. 6d.

The Elements of Conchology, according to the Linnæan System: illustrated by 28 plates, drawn from nature. By the Rev. E. J. Burrows, A. M. F. L. S. 8vo. 16s.

The Elements of Conchology; or Natural History of Shells, according to the Linnæan System. With Observations on Modern Arrangements. By Thomas Brown, Esq. 8vo. 8s. plain, 12s. coloured.

Botany.

A System of Physiological Botany. By the Rev. P. Keith, F. L. S. 2 vols. 8vo. 1l. 6s.

Compendium Floræ Britannicæ. Second edition, corrected, and continued to the end of the third volume of the Flora Britannica. With all the newly discovered Plants from the English Botany, and references to that work throughout. Auctore Jacobo Eduardo Smith, Esq. Aur. M.D. Societatis Linnæanæ Præside, &c. 12mo. 7s. 6d.

The Florist's Manual; or Hints for the Construction of a gay Flower Garden, &c. By the Authoress of Botanical Dialogues, 12mo. 4s. 6d.

The Botanist's Companion; or an Introduction to the Knowledge of Practical Botany, and the Uses of Plants, either growing wild in Great Britain, or cultivated for the purposes of Agriculture, Medicine, Rural Economy, or the Arts, on a new Plan. By William Salisbury, 2 vols. 12mo.

Flora Tunbrigensis; or a Catalogue of Plants growing wild in the neighbourhood of Tunbridge Wells; arranged according to

the Linnæan System, from Sir J. E. Smith's Flora Britannica. By T. F. Forster, F. L. S. 8vo. 9s.

Chemistry.

A Practical Treatise on Chemical Re-agents or Tests; illustrated by a series of experiments, calculated to shew the general nature of chemical re-agents; the effects which are produced by the action of those bodies; the particular uses to which they may be applied in the various pursuits of chemical science, and the art of applying them successfully. By Frederick Accum, Operative Chemist, 12mo. 5s.

Geology.

Transactions of the Geological Society, established Nov. 13, 1807. Vol. III. with plates, &c. 4to. 3l. 13s. 6d.

Transactions of the Geological Society. Vol. IV. Part I. 18s.

Outlines of Geology, by W. T. Brande, Sec. R. S. &c

Agriculture and Rural Economy.

The Agricultural State of the Kingdom in February, March, and April, 1816; being the volume printed by the Board of Agriculture, and subsequently suppressed, 8vo. 15s.

The System of Farming practised at Teston, in Kent, 8vo. 1s.

Observations on a new mode of Stacking Corn, peculiarly adapted to wet seasons, recommending a plan successfully practised, by which corn may be stacked with advantage, soon after being cut down. By William Anderson, farmer, Angus-shire, 8vo. 1s. 6d.

A Treatise on the Physiology and Pathology of Trees; with Observations on the Barrenness and Canker of Fruit Trees, the means of Prevention and Cure. By P. Lyon, 8vo. 10s. 6d.

Fragments on the Theory and Practice of Landscape Gardening, containing some remarks on Grecian and Gothic Architecture, &c. &c. By H. Repton, Esq. assisted by his son, John Adey Repton, F. S. A. imperial 4to. 6l. 6s.

Geography.

A View of the Present Condition of the States of Barbary: or an Account of the Climate, Soil, Produce, Population, Manufactures, and Naval and Military Strength of Morocco, Fez, Algiers, Tripoli, and Tunis. By W. Janson, 12mo. 5s.

An Account of Tunis, its Government, Manners, Customs, and Antiquities; especially of its Productions, Manufactures, and Commerce. By Thomas Macgill, 8vo. 7s.

Historical Memoirs of Barbary, and its Maritime Power, as connected with the plunder of the seas; including a Sketch of Algiers, Tripoli, and Tunis, 18mo. 2s. 6d.

Documents relative to the Kingdom of Hayti. By P. Sanders, Esq. Agent to the King of Hayti, 8vo. 10s. 6d.

A new and correct Map of the United States of America, on Six Sheets; carefully compiled from Surveys and the most authentic Documents. By Samuel Lewis, 1l. 6s. mounted.

MEDICINE, SURGERY, ANATOMY, AND PHYSIOLOGY.

Practical Illustrations of Typhus Fever, Dysentery, Erysipelas, Visceral Inflammations, Acute Rheumatism, Ophthalmia, Apoplexy, Madness and other Diseases. By John Armstrong, M. D. 8vo. 10s. 6d.

Observations on the Harveian Doctrine of the Circulation of the Blood. By George Kerr, 12mo. 4s.

A Treatise on Diseased Spine, and on Distorted Spine, with cases to illustrate the success of a new method of cure. By T. Sheldrake, 8vo.

Practical Observations on the Diseases of the Urinary Organs, particularly those of the Bladder, Prostate Glands, and Urethra. Illustrated by Cases and Engravings. By John Houship, with four plates, 8vo. 15s.

An Answer to Dr. Kinglake, shewing the danger of his cooling treatment of the Gout. By John King, 8vo. 5s. 6d.

Medico-Chirurgical Transactions, published by the Medical and Chirurgical Society of London. With four plates, Vol. VII. Part I. 8vo. 10s. 6d.

The same, Vol. VII. Part II. 8vo. 12s.

An Introduction to Comparative Anatomy and Physiology: being the two Introductory Lectures, delivered at the Royal College of Surgeons, by William Lawrence, F. R. S. 8vo. 6s.

A Treatise on the Nature and Cure of Gout; comprehending a General View of a morbid State of the Digestive Organs, and of Regimen, with some Observations on Rheumatism. By Charles Scudamore, M. D. 8vo. 12s.

The Principles of Surgery, as they relate to Surgical Diseases and Operations. By John Bell, Surgeon, Parts I. to XII. 4to. 12s. each.

Surgical Observations: being a Quarterly Report of Cases in Surgery. By Charles Bell, Part I. 8vo. 6s.

Delineations of the Cutaneous Diseases comprised in the Classification of the late Dr. Willan; being a Republication of the greater part of the Engravings of that author in an improved state. Together with a new Series, which will comprehend the remainder of the System, as completed in the "Practical Synopsis of Cutaneous Diseases." By Thomas Bateman, M. D. Fasciculus VII. with six coloured Plates, 4to. 1l. 1s.

A Memoir on the cutting Gorget of Hawkins, by Antonio Scarpa, with an Engraving. To which is added a Biographical

Account of J. B. Carcano Leone. Translated from the Italian, by J. H. Wishart, 8vo. 5s.

An Epitome of Juridical and Forensic Medicine; with Observations on Hanging, Drowning, Lunacy, Child-Murder, Abortion, &c. for the Use of Coroners, Medical Men, and Barristers. By George Edward, Male, M.D. 8vo. 7s.

A Treatise on the Diseases of the Arteries and Veins; containing the Pathology and Treatment of Aneurisms and Wounded Arteries. By John Hodgson, Member the of Royal College of Surgeons in London, 8vo. 15s.

Report of Observations made in the British Military Hospitals in Belgium, after the Battle of Waterloo. With some Remarks on Amputation. By John Thomson, M. D. F. R. S. E. Professor of Military Surgery to the University of Edinburgh, &c. 8vo. 8s.

Some Practical Observations in Surgery, illustrated by Cases embracing the subjects of Amputation, Erysypelas, Necrosis, Internal Abscess, &c. By A. C. Hutchinson, 8vo. 7s.

An Essay on the common Cause and Prevention of Hepatites, or Bilious Complaints in general, as well in India as in Europe. With an Appendix, recommending the old Sub-muriates of Mercury, in preference to those now in use. By Charles Griffith, M. D. 8vo. 7s.

Observations on the projected Bill for restricting the Practice of Surgery and Midwifery to Members of the Royal Colleges of London, Edinburgh, and Dublin, and to Army and Navy Surgeons. With some modifications proposed, by which the measure will be more compatible with the true interests of the public, and not oppressive to the present race of pupils, 8vo. 3s. 6d.

A Vindication of the University of Edinburgh, as a School of Medicine, from the Aspersion of a Member of the University of Oxford. By Lawson Whalley, M. D. 8vo. 2s.

A Treatise on Uterine Hæmorrhage, by Duncan Stewart, M. D. 8vo. 6s.

Elements of Physiology, by A. Richerand, Professor of the Faculty of Medicine of Paris, &c. Translated from the French, by J. G. M. De Lys, 8vo. 12s.

Synopsis Nosologiæ, or Outlines of a New System of Nosology. By T. Parkinson, M. D. 8vo. 9s.

Medical, Geographical, and Agricultural Report of a Committee appointed by the Madras Government to inquire into the Causes of the Epidemic Fever, during the years 1809, 1810, and 1811. 8vo. 6s. 6d.

An experimental Enquiry into the Effects of Tonics and other Medicinal Substances on the cohesion of the animal Fibre. By the late Adair Crawford, M. D. F. R. S. Edited by Alexander Crawford, M. D. 8vo. 6s.

Observations on the Structure of the Brain; comprising an Estimate of the Claims of Drs. Gall and Spurzheim to discovery in the Anatomy of that Organ. By John Gordon, M. D. F. R. S. E. With Plates, 8vo. 7s. 6d.

The Institutions of Physiology by Professor Blumenbach; translated from the Latin, and supplied with numerous and extensive Notes, by John Elliston, M. D. 8vo. 10s. 6d.

Engravings intended to illustrate some of the Diseases of Arteries. With Explanations, by Joseph Hodgson, 4to. 1l. 16s.

A Practical Explanation of Cancer in the Female Breast: with the Method of Cure, and Cases of Illustration. By John Redman, M. D. 8vo. 8s.

Anecdotes, Medical, Chemical, and Chirurgical. Collected, arranged, and translated by an Adept. 2 vol. 12mo. 10s. 6d.

A Caution to Vaccine Swindlers and Impostors. By John King, 8vo. 5s.

Medical Suggestions for the treatment of Dysentery, of Intermittent and Remittent Fevers, as generally prevalent at certain seasons among troops in the field. By E. S. Somers, M. D. 8vo. 6s.

Mechanical Philosophy and Mathematics.

Elements of Mechanical and Chemical Philosophy. By John Webster. Illustrated by numerous Wood-cuts, 8vo. 10s.

An Elementary Treatise in the Differential and Integral calculates. By S. F. La Croix, translated from the French, 8vo. 18s.

Elements of Plane and Spherical Trigonometry; with their applications to heights and distances, projections of the Sphere, Dialling, Astronomy, the Solution of Equations, and Geodesic Operations. By Olinthus Gregory, LL.D. 12mo. 5s.

An Elementary Treatise on Astronomy, or an easy Introduction to the knowledge of the Heavens. By the Rev. A. Mylne, 8vo. 9s.

A Treatise on Spherics; comprising the Elements of Plane and Spherical Geometry, and of Plane and Spherical Trigonometry; together with a series of Trigonometrical Tables. By D. Cresswell, Fellow of Trinity College, Cambridge, 8vo. 7s.

An Essay on the Origin and present state of Galvanism; containing Investigations of the Principal Doctrines offered for the Explanation of its phenomena. By M. Donovan, 8vo. 12s. 6d.

Time's Telescope for 1817; or, a Complete Guide to the Almanack: containing an Explanation of Saint's Days and Holydays; with Illustrations of British History and Antiquities, Notices of obsolete Rites and Customs, and Sketches of Comparative Chronology, Astronomical Occurrences in every month; comprising Remarks on the Phenomena of the Celestial bodies: and the Naturalist's Diary; explaining the various appearances

in the Animal and Vegetable Kingdoms. To which is prefixed an Introduction, containing the Principles of Zoology. Published Annually, 12mo. 9s.

An Introduction to the Method of Increments, expressed by a new form of Notation; shewing more intimately its relation to the Fluctional Analysis. By Peter Nicholson, 8vo. 8s.

A Course of Military Instruction; comprising Practical Geometry, the Principles of Plan-drawing, and Elementary Fortification. By Lieut. Col, Pasley, 8vo. 3 vol. with 1190 Engravings. 3l.

General Science.

The Supplement to the Encyclopedia Britannica. Edited by Macvey Napier, Esq. F. R. S. E. 4to. Vol. II. Part I. 1l. 5s.

Voyages and Travels.

Observations on England, its Laws, Manufactures, Commercial and Civil Polity ,Manners, Customs, and Vices. Translated from the Original Manuscript Letters of Oloff Napea, formerly an Officer of Cavalry in the Russian Service, 8vo. 8s.

Voyages and Travels in the South Sea. By W. Burney, vol. iv. royal 4to. 2l. 10s.

Travels in Upper Italy, Tuscany, and the Ecclesiastical State, in a Series of Letters written to a friend in the years 1807 and 1808. By Baron d'Uklanski, 12mo. 2 vols. 1l. 1s.

A Diary of a Journey into North Wales. By the late Samuel Johnson, LL.D. Printed from the original MS. in his own handwriting; together with a fac.

Journal of Travels in Sweden, Russia, Poland, &c. during the years 1813 and 1814. By the Rev. T. James, of Christ Church, Oxford, 4to. 3l. 3s.

Sketches of India: or Observations descriptive of the Scenery, &c. in Bengal. Written in India in the years 1811, 1812, 1813, and 1814. Together with notes on the Cape of Good Hope, and St. Helena, written in those places in February, March, and April. 1816. 8vo. 7s.

The Traveller's Guide in Switzerland, describing every object of curiosity, &c. &c. By Henry Coxe, Esq. 12mo. 5s.

A Tour through some parts of Istria, Carniola, Styria, Austria, the Tyrol, Italy, and Sicily, in the spring of 1811., By a young English merchant.

Travels in Brazil, from Pernambuco to a Seara, besides occasional Excursions. By Henry Koster. Illustrated by Plates of Costumes, 4to. 2l. 10s.

Itinerary of the Morea; being a description of the Routes of that Peninsula. By Sir William Gell, Bart. with a map, 8vo. 10s. 6d.

Mungo Park's First Expedition to Africa, 4to. a New Edition, with maps, &c. 2l. 2s.

The History of Ceylon, from the earliest period to the year 1815; with characteristic details of the Religion, Laws, and Manners of the people, and a collection of their moral maxims and ancient proverbs. By Philalethes, A. M. Oxon. (i. e. Rev. Robert Fellowes.) To which is subjoined Robert Knox's Historical Relation of the Island, with an Account of his Captivity during a period of nearly 20 years, 4to. 2l. 12s. 6d.

A View of the Agricultural, Commercial, and Financial Interests of Ceylon; illustrated by Official Documents. By Anthony Bertolacci, Esq. &c. &c. and a map compiled at Columbo from the latest Surveys in the year 1813, by Captain Senneider, Ceylon Engineer, 8vo.

Narrative of a Residence in Belgium during the Campaign of 1815, and of a visit to the Field of Waterloo. By an English Woman, 8vo. 12s.

An Account of the singular Habits and Circumstances of the People of the Tonga Islands, in the South Pacific Ocean. By William Mariner, of the Port au Prince, private ship of war, the greater part of whose crew was massacred by the natives of Lefooga, 8vo. 2 vol. 1l. 4s.

Memorandums of a Residence in France, in the winter of 1815-16; including Remarks on French manners and Society; with a Description of the Catacombs, and notices of some other objects of curiosity, and works of Art, not hitherto described. 8vo. 12s.

Travels in Upper Italy, Tuscany, and the Papal Ecclesiastical State, in 1807 and 1808. By Baron d'Uklanski, 12mo. 2 vol. 1l. 1s.

Peninsular Sketches during a recent Tour, by John Mitford, Jun. 8vo. 8s.

A Tour through Belgium, Holland, and along the Rhine, and through the North of France in 1816. By James Mitchell, M. A. 8vo. 12s.

Narrative of a Journey in Egypt and the Country beyond the Cataracts. By Thomas Legh, Esq. M. P. 4to. 1l. 1s.

Narrative of a Residence in Ireland in 1814 and 1815. By Anne Plumptree, 4to. 2l. 10s.

The Unedited Antiquities of Attica, comprising the Architectural Remains of Eleusis, Rhamnus, Sunuim, and Thoricus. Published by the Dilettanti Society. Imperial folio, 10l. 10s.

A Quarterly List of Foreign Scientific Publications.

Natural History.

1. Histoire de polypiers corraligènes flexibles, vulgairement nommés Zoophites, 1 vol. 8vo. Par M. Lamoroux.

2. Monographie du Trigonocephale. Par M. de Jonnès. Paris.

3. Mémoires pour servir à l'histoire des Mollusques. Par M. Cuvier, 1 vol. 4to. Paris.

4. Systéme du Regne Animal. Par MM. Cuvier et Latreille, 4 vol. 8vo. plates. Paris.

5. Dictionnaire d'Histoire Naturelle. Nouvelle Edition, plates. 2d. Livraison of 4th, 5th, 6th vol. Daterville.

6. Dictionnaire d'Histoire Naturelle. Nouvelle Edition. Levrault, 1st. and 2d. vol. Supplement and plates

7. Die Voegel der Schweitz, &c. or Systematic Description of the Birds of Switzerland, 1 vol. Zurich.

8. Natur Koerper, &c. or the Anorganic bodies of Nature considered with respect to their affinities, &c. By M. Gravenhorst. Breslau. Vol. gr. in 8vo.

9. *Beitraege*, &c. or Memoir on the Anatomy and Physiology of the Medusæ, 1 vol. By *Gaede*. Berlin.

10. *Elementarbuch*, or Elementary treatise on Entomology, and particularly of the *Scarabées*. By Capt. Malinowsky, 1 vol. Quedlinbourgh.

Botany.

1. Des Plantes rares cultivées à la Malmaison, 8me. cahier. Par Bonpland.

2. Examen d'un ouvrage pui a pour titre " *Illustrationes Theophrasti*," &c. Auctore. I. Stackhouse. Paris.

3. Flore des Environs de Rouen. Par M. Longchamp. Rouen. 2 parts, French and Latin.

4. Flore du Dictionnaire des Sciences Medicales, 26, 27, 28, livraisons, 8vo. plates. Paris.

5. Les Liliacées par Redouté, 80th and last livraison.

6. Algæ aquaticæ quas et in littora maris dynastiam Severanam et Frinam orientalem, &c. collegit et exsiccavit. H. B. Jungers. I. and II. Decad. Hanover.

7. Flora Monacensis quas in lapide pinxit Mayrhoffer. Munich. in fo.

8. Flora Ticinensis, auctoribus Rocca et Balbis. Ticini.

Chemisty, and General Sciences.

1. Mémoires de l'Academie des Sciences de Marseilles.

2. Journal de Pharmacie et des Sciences accessoires. Paris. September, October, November.

3. Memorie della Società Italiana. Parte Fisica. Tomo XVII.
4. Bibliothèque Universelle des Sciences et des Arts. Geneva, July, August, September.
5. Nouvelle Nomencloture Chymique d'après Thenard. Par M. Caventon, 1 vol. 8vo. Paris.
6. Tableaux chimiques du Règne Animal, from the German. By Robinet, 1 vol. 4to.
7. Notice historique sur l'utilisation du Gas Hydrogène. Par Mons. Windsor. Paris.
8. Journal des Sçavans. October. Paris. 4to.

Mineralogy and Geology.

1. Leçons de Géologie données au College de France. Par Delametherie, 3 vol. Paris.
2. La Creation du Monde ou Systeme d'organisation primitive Par un Austratien, 2 Ed. 2 vol. Paris.
3. Observations de Pyrite gilvo. hepatico, et radiato auctorum. By Hausmann, vol. gr. in 8vo. Goettingen.
4. *Bemerkungen*, &c. or Mineralogical observations made on the Carpathian mountains, 2d. Edition.
5. *Handbuch der Oryctognosie*, or Manual of Oryctognosy. By H. Steffens, 2 vol. Halle.
6. *Ueberblik*, &c. or Systematic view of a classification of simple fossiles by Pohl, in 4to. Prague.

Agriculture and Rural Economy.

1. Sur le Systeme des Agriculteurs à l'egard des Abeilles. Par M. Chambon. Paris.
2. Proceedings of the Board of Agriculture at Chalons. Chalons.
3. Notice sur l'Epizootic du gros betail à Alfort. Paris.
4. Mémoir sur l'inoculation du Claveau. Paris.
5. Sur le fabrication des Vins. Par M. Julien. Paris.
6. Notice Topographique de tous les vignobles connus. Par A. Jullien. Paris.
7. Il buon Governo dei bachi da Seta. Del Conte Dandolo. Milan.
8. Notice sur les mots Hippiatre, Vétérinaire, et Marechal. Par M. Huzard. Courcier, 3d. Edition.
9. Manuel du Vigneron du departement de la Moselle. Par M. Jaunez.

Geography.

1. Confutation de quelques erreurs de Strabon. Paris.
2 Trattato Elementaire de Geografia. Del Sig. Flauti. Naples.
3. Carte des côtes de la Barbarie. Par Collin. Paris.
4. Mineraire du Royaume de France, &c. Par Langlois.
5. Carte detaillés des environs de Paris. Par Gotthold.

6. Dictionnaire historique, topographique, &c. des environs de Paris.

7. Briefe, &c. or Letters on the Caucasus, and Persia. By Freygang, 1 vol. gr. in 8vo. Hambourgh.

8. Carta del Novo Regno Lombardo Veneto, 4 sheets. Milan.

Medecine, Surgery, Anatomy and Physiology.

1. Traité des Maladies nerveusse, 2 vol. Par M. Villermay.

2. Mémoire sur l'introduction de la fievre jaune dans les Antilies. Par M. de Jonnés. Paris.

3. Mémoire sur les Géophages des Autilles. Idem.

4. Note sur le Magnetisme Animal. Par Montegre. Ed.

5. Dictionnaire des Sciences Medicales. Tom. XVIII. Paris.

6. Essai sur la nature et le caracter des Maladies en général, et sur le mode d'action des medicamens. Par M. de Thoissey. Paris.

7. Difserration sur les dissenteries. Broch. in 4to. Par M. Bétis, D. M. Paris.

8. Journal universel des Sciences Medicales July.

9. Annales Chimiques de Montpellier. July and August.

10. Journal de Medecine de Leroux. September. October.

11. Bibliotheque Medicale. November.

12. L'Art d'appiiquer le pâte arsenicale. Par le Doct. Patris. Paris.

13. Opuscules d'anatomie et d'Histoire Naturelle. Par G. Roubieu. Montpellier.

14. Ephemerides des Sciences naturelles. Paris. No. II.

15. Nouveaux Aperçus sur les causes et les effets des glaires. Par Dubreuil. Broch. Paris. 8vo.

16. Exposé des bains de vapeur. Par Gerard.

17. Topegraphie physique et medicale des environs de Strasbourgh. Par M. Gnaffenauer, 1 vol. 8vo.

18. *Journal der praktischen Heilkunde,* &c. or Hufeland Journal of practical medicine. April, May, June, 1816. Berlin.

19. *Medizinische Annalen,* or Annals of Medecines, &c. Altenbourgh.

20. *Istoria d'una frattura,* or History of a fracture of the neck of the former mistaken for a dislocation of that bone. By Dr. Benigria. Brescia.

21. *Entwurf eines Systems,* or a System of medical Antropology, &c. By D. Lucoe, 1 vol. Francfort.

22. *Beobachtunger,* &c. Observations sur les concrétions mobiles dans les articulations, &c. By Schreger. Erlang.

Mechanic Philosophy, Mathematics, and Astronomy.

1. Traduction compléte de l'Almageste de Ptolomée. Par M. Halma, 2 vols. Paris.

2. Traité Elémentaire du Calcul des Probabilités. Par M. Lacroix, 1 vol. 8vo. Paris.
3. Mémoire sur la Capillarité. Par M. Sarthon.
4. Première et Deuxième Leçons experimentale d'Optique. Par M. Bourgeois. Paris.
5. Annales de Mathématiques pures. Tom. VI. 4to. Nismes.
6. Exercice du Calcul Integral. Par Legendre, 4to.
7. Exposé Sommaire du Système du Monde. Par Jambon, 2d edit.
8. *De Hauptlehren*, &c.; or, Fundamental Principles of Geometry and Trigonometry. By Brandes, 1 vol. 8vo. Oldenburgh.

Voyages and Travels, and Navigation.

1. Voyages de Découvertes aux Terres Australes. Historique. Par Freycinet, 1 vol. 4to. Atlas.
2. Oeuvres de Gauthey, 3d vol. contenant les Mémoires sur les Canaux de Navigation.
3. Manuel du Voyageur en Suisse. Par M. Ebel.
4. Voyage en Savoie, en Piemont, à Nice, et Genes. Par M. Millin, 2 vol. 8vo.
5. Voyages d'un François fugitif dans les années 1791, &c. Paris, 1 vol. 8vo.

List of Foreign Publications since our last.

Natural History.

Vermischte Schriften; or, Essays on various subjects of Natural History, Physiology, Anatomy, &c. By MM. Treviranus, 1st vol. Gottingen, 1816.

Magasin de Physique et d'Histoire Naturelle. Par la Société des Naturalistes de Berlin. VIIIth year, 2d quarter. 1816. Berlin.

Le Règne Animal distribué d'après son Organisation pour servir de Base à l'Histoire Naturelle des Animaux, &c. Par M. Cuvier, 4 vols. 8vo. 25 plates. Paris, 1816.

Mémoires pour servir à l'Histoire et à l'Anatomie des Mollusques. By the Same, 1 vol. 4to.

Les Papillons. Par Ch. Malo, 1 thick vol. 18mo. 12 plates. Paris.

Botany.

Herbier Générale de l'Amateur, &c. XIIth part, being the last of vol. 1st, 8vo. Paris.

Plantes Rares de Malmaison. By Bonpland, Xth part.

Floræ Italicæ Fragmenta, seu Plantæ rariores, in variis Italiæ regionibus, &c. ≥ D. Viviani, fos. 1, gr. in 4to. plates. Genoa.

Darstellung und Beschreibung, &c.; or a Description of the Plants used in Pharmacy. By F. G. Hayne, tome IV. 4to Berlin.

De Distributione Geographica Plantarum Prolegomena. By Humboldt, 1 vol. 8vo. Paris, plate.

Physical Sciences and Chemistry.

Annalen der Physik. Gilberts. August, Sept. Octob. Leipsic.

Darstellung, &c.; or Exposition of the Numeric Differences the Chemical Elements. By Doebereirer, gr. in fol. Jena, 1816.

Versuche, &c.; or, Experiments tending to rectify and promote the progress of Chemistry. By Fricker, 1 vol. gr. in 8vo. Breslau.

Neues Journal der Chimie, &c. Schweiger. Last quarter 1816. Nuremberg.

Annales de Physique et de Chimie. Octob. Nov. December. Paris, 8vo.

Journal de Physique. Nov. Decemb. 1816. Paris, 4to.

Journal de Pharmacie et Sciences Accessoires. Octob. Nov. December, and Jany. 1817.

Mémoires de Statique Chimique; ou Commentaires des Theories Chimiques de Berthollet. Par M. Otto, 1st vol. theoretical part, grande in 8vo. Wisbaden, 1816.

Les Corps Anorganiques de la Nature, considérés et classés d'après leur *affinitiés* et leur transitions. By Gravenhorst, vol. gr. in 8vo. 7 plates. Bratan.

Mathematics, Astronomy.

Metrologie Universelle, ancienne et moderne. By Malaiseau, 1 vol. 4to. Bourdeaux.

Tables de Logarithmes pour les Nombres et les Sinus; from 1 to 20,000 with the Sinus of Tangents, &c. 1 vol. 16mo. Saint Malo.

Zeitschrift für Astronomie; or, Journal of Astronomy and the Analogous Sciences. By Lindenau and Bohnenberger. Numb. for August and Sept. 1816.

Problemes géometriques avec leur Solutions. By Schaeffer, 1 gr. in 8vo. 4 plates. Oldenburgh.

Erweiterungen, &c. Nouveaux Eclaircissemers de Sciences Mecaniques, &c. By Langsdorf, 1 vol. gr. in 8vo. plates. Manheim.

Dyadique; or, Exposition of a System of Numeration, in which every thing is expressed by two signs only. Par *Drais* 2d edit. 1816.

MEDICINE, SURGERY, ANATOMY.

Archiv der Medicin; or Journal of Medicine, Surgery, and Pharmacy. 1st year 1816, 1 vol. 8vo. Arau.

Archives de Physiologie Publics. Par Meckel, 1st vol. 661 pag. plates. Halle, 1816.

Ueber den Zustand, &c.; or, Memoir on the actual State of Ophtalmology in France and Germany. By Wenzel, 8vo. Nuremberg, 1816.

Journal der Praktischen Heilkund, &c.; or, Journal of Medicine. By Hufeland. Last quarter 1816. Berlin.

Bibliothek der Heilkunde, &c.; or, Medical Library of Practical Medicine. By same Author. July, 1816.

Repository of Medical Experiments, published by Dr. Horn. Berlin, 1816.

Ueber die Wirkungen; or, Treatise on the Efficacy of the Sulphuret of Potash in Croup and other Diseases. 1 vol. 8vo. 1816. Halle.

Handbuch der Pathologie; or a Manuel of Pathology and Therapeutics. By Raiman, 1st vol. 8vo. Vienna, 1816.

Medizinische Annalen. May 1816. Altenbourg.

Mémoires sur les Principales Maladies de Enfans Par le Dr. *Goelis*, 1st vol. 8vo.

At the annual transference of the Rectorship of the University at Leyden, the late Rector, Professor J. Van Voorst, D. D. delivered, on the 8th of February last, an Oration: "de commodis atque emolumentis, quæ e singulari Principum Europæorum, in profitenda, his temporibus, Religione Christiana, consensu, sperare et augurari liceat."

Dr. Granville is about to publish an Account of the Scientific Establishments of France.

London: Printed by W. Bulmer and Co.
Cleveland-row, St. James's.

INDEX.

Academy of Sciences of the Royal Institute of France, proceedings of, 179-190—distribution of medals to the Academicians, 179.
Aching, sense of, how produced, 16, 17.
Acids and sulphuretted hydrogen gas, experiments on the mutual decomposition, of, 152, 153.
Adams (Sir William) on the restoration of vision, injured or destroyed by the cornea assuming a conical form, 403-415.
Agave, account of a new species of, 86 90.
Agrarian divisions of the Egyptians, observation on, 187.
Air, effects of, on vegetation, 48-50.
Alkornok, an Indian medicine, analysis of, 172.
Allan (T Esq.) on the lead mine of Dufton, 198-200.
Alstenia Teiformis, account of, 92—experiments on, by M. Palacio Faxar, 93—and by M. Faraday, 93, 94.
Alumine, fusion of, with the blow-pipe, 110.
Amaryllis, genus, review of, 342-371.
America, botanical researches of MM. Humboldt and Bonpland, in 52-54.
Animal genealogy, outline of a new system of, 157.
Animals, new classification of, 429-431.
Annales de Chimie, analytical review of, 159-166, 427-448, 452, 453—strictures on, 449-452.
Antshar or poison tree, account of, and of the mode of preparing the poison, 332-335—results of experiments with the poison, 336-339.
Aphonia, or loss of utterance, cured by electricity, 204.
Aquatic plants, effects of, 55.
Arabic digits, original formation of, 147.
Asiatic Researches, vol. XII. notice of, 388.
Atmosphere, the causes of the constant proportions of azote and oxygene in, accounted for, 421-423.
Atmospheric electricity, researches on, 416-418.
Atmospheric electrometer, account of, 249-253.
Attraction and repulsion without electricity, phenomena of, 427, 428.

B

Babbage (Charles, Esq.) solutions of some problems, by means of the calculus of functions, 371-379.
Banca (Island of) its physical constitution and productions, 190, 191—process followed in working the tin mines there, 191, 192.

Barbançois (M. de) on a new classification of animals, 429-431.
Barytes, fusion of, with the blow-pipe, 109—metal of, thus obtained, 119-120.
Batavian Society's Transactions, analysis of, 326—institution and objects of the Society, 327—notice of its earlier volumes, 328—contents of the 7th vol. 329—importance of cultivating the Javanese language, 330—the fable of the oopas tree exploded, 331, 332—account of the antshar or real poison tree of Java, and the mode of preparing the poison, 332-335—results of experiments with the poison, 336—338, 339.
Baudin (M.) geographical discoveries of, stated, 383-385.
Beans, diseased, proposed remedy for, 180.
Berzelius (M.) supplement to the discoveries of, 445.
Beudant (M.) on the possibility of rearing the river mollusca in salt water, and vice versa, 159, 160.
Biblioteca Italiana, analysis of, 177-179.
Bibliothèque des Sciences et des Arts, analysis of, 415-426.
Bichât (M.) examination of his theory of muscular motion, 225, 226.
Bigelow (Dr.) on the use of the clavus, or ergot of rye, in medicine, 60—notice of experiments on this disease in rye, 61—its effects on the human system, 62—first used as a medicine in America, 62—notice of cases in which it was exhibited, 63, 64—observations on the ergot of wheat, 65—efficacy of ergot, in parturition, 66—abstract of his account of the White Mountains, 392-399.
Blood, on the heat evolved by, during coagulation, 246-249.
Blow-pipe (improved) account of, 379-382.
Blue Mountains, journal of an excursion beyond, 455-457.
Bonpland (M.) botanical researches of, in America, 52-54.
Boopideæ, a new family of plants, account of, 186.
Borneo (island) notice of, 192—singular customs of the aboriginal inhabitants of, 340, 341.
Braconnot (M.) on the use of the Datisca cannabina in dyeing, 435, 436.
Brande (W. T.) plan of his extended and practical course of lectures on chemistry, 213-215—notice of his practical lectures and demonstrations in chemistry, 466-468.
Brewster (Dr.) on the descent of the fluid which lubricates the cornea, 127-131—experiments of, on light, 207—on the decomposition of light by simple reflection, 211—on the effects of mechanical pressure in communicating double refraction to regularly crystallised bodies, 460—experiments of, on the action of regularly crystallised bodies upon light, 461.
Bronze, ancient, test for ascertaining, 115, *note*.
Brown (Dr. John) system of excitability exploded, 228-230.
Burchell (John, Esq.) notice of travels by, in South Africa, 79—arrives at the village of Klaarwater, *ibid*—difficulty of pro-

curing Hottentots to accompany him, 80—reaches the village of Graaf-Reinet, 81—his friendly reception by the Bushmen, *ibid*—discoveries by him, in natural history, 82—reaches Litaa-Kun, *ibid.*—prosecutes his researches, 83—returns towards Cape Town, 84—explores the Auteníqua country, 85—results of his travels, 86.

C

Calculus of functions, solutions of some problems by means of, 371 379.
Caloric, experiment on the transmission of, 424.
Candolle (M. de) on the origin of the ergot or clavus in corn, 272—proof that it is a species of sclerotium, 273-277.
Campbell (Colin) adventures of, 74—is landed on one of the Sandwich islands, *ibid.*—returns to England, 77—account of his farm, 78-79.
Cape of Good Hope, appearance of, 210.
Carraccas, tremendous earthquake of, described, 400-402.
Cardamine pratensis, observations on the leaves of, 156.
Cassini (M.) observations of, on a new family of plants, 186.
Cataract, Indian operation for, described, 68-72.
Cauchy (M.) demonstration of a curious theorem in numbers, 175, 176.
Chapman (Mr. W.) on the formation of coal districts, 205.
Clarke (Dr. D. E.) experiments of, with Newman's blow-pipe, by inflaming a highly condensed mixture of the gaseous constituents of water 104—description of his apparatus, 106—rapid fusion of platinum, 107—of palladium, 108—of various earths, 108 110—of alkalies, 116—of native compounds, 110-113—combustion of the diamond, 113—experiments with some of the metals, 114-118—metals obtained from the earths of barytes and strontium, 119-122—iron obtained from meteoric stones, 123—account of the repetition of his experiments, but with different results, 461, 462.
Classification of animals, new system of, 429-431.
Clavus of rye and wheat, *see Rye, Wheat*.
Clegg (Mr.) improvements of, on gas-apparatus, 132-138.
Coagulation of blood, see *Blood*.
Coal-districts, conjecture on the formation of, 205.
Colchicum autumnale, effects of, 204.
Cold, effects of, on vegetation, 46.
Colin (M.) experiments of, on the manufacture of hard soaps, 444.
Compound substances, results of the fusion of, with the blow-pipe. 110, 113.
Coniferous plants of Kæmpfer, observations on, 309-314.
Contortion, sense of, how produced, 15.

Cordier, (M.) on the composition of volcanic rocks, 434.
Cornea, observations on the descent of the fluid which lubricates the, 127-131.
Crystallized bodies, experiments on,

D

Daniell, (J. F. Esq.) on the mechanical structure of iron developed by solution, and on the combinations of silex in cast iron, 278-293.
Darwin, (Dr.) theory of, concerning sensorial power, exploded, 229, 230.
Datisca cannabina, on the use of in dyeing, 435, 436.
Davy, (Sir Humphrey) experiments of, and new views on flame, 124-127—notice of his further experiments on flame, 463, 464—efficacy of his wire-gauze safe-lamps, 464.
Davy, (Dr. John), on the temperature of the air, &c. between the tropics, 208-210—on the heat evolved during the coagulation of blood, 246-249.
Dayak, or aboriginal inhabitants of Borneo, notice of, 340, 341.
De Luc, (M.) observations of, on the primitive matter of lavas, 158.
Derby, infirmary, mode of warming and ventilating, 201-204.
Dessaignes, (M.) on the influence of temperature, mechanical pressure, and the humid principle, on electricity, 154, 155—on the phenomena of repulsion and attraction without electricity, 427, 428.
Diamond, combustion of, by the blow-pipe, 113—observations on the glazier's diamond, 205—account of the Mattan diamond, 342.
Dilatation of fluids, observation on, 163.
Distension, simple mechanical, the cause of the action of involuntary organs of sensation, 22-25.
Dolomieu, (M.) historical notice of, 94—enters the order of Malta, *ibid.*—condemned to death but pardoned, *ibid.*—regains his liberty, and applies himself to the study of natural history, 95—notice of his mineralogical travels, 96—and of his writings, 97—his services to the order of Malta, 98—goes to Egypt, 99—is shipwrecked in the gulf of Tarentum and imprisoned, *ibid.* 100—again liberated, 101—resumes his mineralogical travels, 102—his death, 103—defect of his theory of mineralogical distinctions, *ibid.*
Dufton, account of a leadmine at, 198-200.

E

Ear, organization of, the cause of its receiving impressions of sound, 6.
Earthquake of Caraccas, account of, 400-402.

Electricity, how effected by temperature, mechanical pressure, and the humid principle, 154, 155—experiments on the circulation of the electric fluid, 157—beneficial effects of electricity in aphonia, or loss of utterance, 204—researches on atmospheric electricity, 416-418.
Electrometer, atmospheric, account of, 249-253.
Ergot of rye and wheat. See *Rye*, *Wheat*.
Evans, (Mr.) sketch of the excursion of, beyond the Blue Mountains, in New South Wales, 453-457.
Eye, organization of, the cause of its receiving impressions, 6—account of the Indian operation for cataract in the eye, 68-72.

F

Faraday, (M.) experiments of, on the Alstenia Teiformis, 93, 94.
Fish, (Rev. Dr.) observations of, on the junction of the fresh-water of rivers with the salt waters of the sea, 208.
Flame, experiments on, by Sir Humphrey Davy, 124, 125—new views thence resulting, 125, 127—account of further experiments on flame, 463, 464.
Flinders, (Capt.) priority of his discoveries asserted, 383-385.
Forests, benefit and necessity of, in mountainous countries, 57, 58.

G

Galvanic Pile, dry, of Zamboni, strictures on, 161—vindication of those remarks, 449-452.
Galvanism, benefit of, in asthmatic dyspnœa, 458, 459.
Gas apparatus, account of Mr. Clegg's improvements in, 132—138.
Gases, intestinal, experiments on, 185,
Gay-Lussac, (M.) on the dilatation of liquids, 163.
Glazier's diamond, observations on, 205.
Gold, experiments on the precipitation of the oxide of, by potash, &c. 166, 167—method of assaying, 438, 439.
Gordon, (Dr.) opinion of, respecting the heat evolved during the coagulation of blood, controverted, 246-249.
Granville, (Dr.) report of, on Sig. Monticelli's memoir on the eruption of Vesuvius, in December 1813, 25-34—report of, on M. Vauquelin's experiments on the ergot, or spur of rye, 320-326.
Griping, sense of, how caused, 12.

H.

Haller's theory respecting muscular motion, examined, 225.
Hats, improvement in the manufacture of, 180.
Heat, effects of, on vegetation, 47—remarks on the heat evolved during the coagulation of blood, 246-249—experiment on the transmission of, 424.

Himálaya mountains, observations on the heighth of, 389-392.
Home, (Sir Everard) on the effects of colchicum autumnale, 204—on the formation of fat in the tadpole, 205, 206—on the structure of the feet of animals, moving in opposition to gravity, 206—on the circulation of blood in the lumbricus marinus, 457, 458.
Hooker, (Mr. W. J.) on the *Tayloria Splachnoides*, a new species of moss, 144-147.
Horsfield, (Dr.) on the antshar or poison tree, and mode of preparing its poison, 332-335—results of his experiments with it, 336-339.
Humboldt (M.) botanical researches of, in America, 52-54.
Hunger, sense of, how produced, 13-14.
Hunter, (Dr.) opinion of, on the non-evolution of heat during the coagulation of blood, confirmed, 248, 249.

I.

Ice, found at the bottom of rivers, whose surface was unfrozen, 205.
Infirmary at Derby, mode of ventilating and warming, described, 201-204.
Intestinal Gases, experiments on, 185.
Iron, meteoric mass of, discovered in Brazil, 205—observations on the mechanical structure of iron, developed by solution, and on the combinations of silex in cast iron, 278-293.

J.

Japanese, high civilization of, 197.
Java (island) geological constitution of, 193—remains of antiquities discovered there, *ibid.* 194—account of the language of the Javanese, 194, 195—importance of cultivating it, 330—the fable of the Oopas or poison-tree of Java, exploded, 331—account of the antshar, or genuine poison-tree, and of the manner of preparing the poison, 332-335—results of experiments with the poison, 336-339.
Journals (foreign scientific) analytical review of, 151, et seq.—Journal de Physique, 152-158, 427 438—Annales de Chimie, 159-166, 438 453—Journal de Pharmacie et des Sciences Accessoires, 166-172—Bulletin de la Société Philomathique de Paris, 172-176—Biblioteca Italiana, 177-179—Bibliothèque des Sciences et des Arts, 415-426.

K.

Kæmpfer's history of Japan, authenticity of, proved, 196—observations on the coniferous plants collected by him, 309-314.
Ker, (John Bellenden, Esq.) review of the genus Amaryllis, by, 342-371.
Kirchoff, (M.) on changing fecula into sugar, 167.

L.

Lavas, observations on the primitive matter of, 158.
Lead-mine, geological account of one, at Dufton, 198-200.
Leyden, (Dr.) sketch of Borneo by, 340-342.
Lichens observations on the growth of, 54, 55.
Light, effects of, on vegetation, 48—notice of experiments on by Dr. Brewster, 207—account of its decomposition by simple reflexion, 211.
Lime, fusible with the blow-pipe, 108.
Lumbricus marinus, account of the circulation of blood in, 457, 458.

M.

Madariaga, (Don) explanatory voyage of, down the river Meta, 140-143.
Magnesia, fusion of, with the blow-pipe, 109.
Majendie, (M.) observations on the memoir of, concerning the nutritive properties of substances that do not contain azote, 446-447.
Mattan diamond, account of, 342.
Maynard, (Thomas, Esq.) on the shepherds of the Landes, 253-255.
Medicines, action of, how caused, 21, 22.
Mellowing of wine, a new mode of, 148-150.
Meta, river, description of, 139-143.
Metals, experiments on, with the blow-pipe, 114-118.
Meteoric stones, account of, in the imperial museum at Vienna, 314-320.
Meteorological diary for June, July, and August, 1816, 216-218—for September, October, and November, 470 472.
Mines of tin in the isle of Banca, notice of, 191, 192—of lead at Dufton, in Westmoreland, geological account of, 198-200.
Mirbel, (M.) general views of vegetable nature by, 35—develepement of the law by which different tribes of vegetables are distributed over the globe, 35-44—local circumstances a cause of the variation of temperature, 44, 45—effects of cold, heat, and light on vegetation, 46-48—botanical researches in the Pyrenees and Alps, 50, 51—and in America, 52-54—on the growth of lichens, 54, 55—and of aquatic plants, 56—baneful effects of destroying trees in mountainous countries, 57—important results produced by vegetation, 58-60.
Miscellaneous intelligence, 208-215.
Monticelli, (Signor) on the eruption of Vesuvius, in December, 1813, 25-34. See *Vesuvius*.
Moss, a new species of, described, 144-147.
Mountains, cause of vegetation on, 50.
Murray's, (Dr.) system of chemistry, character of, 253.

Musuclar motion, laws of, considered, 223—nature of muscular motion defined, 224—theories of Haller, Whytt, and Bichât examined, 225, 226—proofs, that nervous influence produces changes in muscular motion, 227, 232, 233—Brunonian theory examined and exploded, 228, 229-231—no radical difference between voluntary and involuntary motion, 233-237—the existence of certain contractions no proof to the contrary, 237-240—the connection between the vital properties and the state of circulation examined and illustrated, 241-246.

N.

Nausea, sense of, how produced, 12.

Newman, (Mr.) description of his new machine to measure a ship's way by the log line, 90, 91—account of experiments made with his blow-pipe, by inflaming a highly condensed mixture of the gaseous constituents of water, 104-123—observation on its singular utility, 124—account of his improved blow-pipe, 379-382.

Nixon, (Dr) on the effects of electricity in aphonia, 204.

Noehden, (Dr.) observations of, on the meteoric stones in the imperial museum at Vienna, 314-320.

Nutrition of plants, observations on, 58.

——— of animals, experiments on, 183, 184.

O.

Olefiant gas, observation on the oil obtained from, 166.

Olivine, a new product from the gum of the olive tree, 176.

Organs, (sentient) difference of texture in, the cause of the varieties of sensation, 3, 4—changes in the mechanism of the organ of sense, 5—of taste and smell, 6—of touch, 7-9—the seat of these sensations proved, 9-11—affinity between changes exciting sensations of cold and heat on the external surface, and those which occasion sensations of nausea and thirst on the internal, 13-17—changes in the organs of voluntary motion produced by fatigue, 14-15—the use of the sentient organs stated, 17-21—simple mechanical distension, the cause of action in involuntary organs, 17-24

Oxygene and hydrogene, compressed, report of experiments with, 461, 462.

P.

Palacio-Faxar, (M.) on the *Alstenia Teiformis*, 92—experiments made by him upon it, 93—his description of the river Meta, 139-142—account of the earthquake of Caraccas, 400-402.

Palladium, fusion of, with the blow-pipe, 108.

Park, (Dr.) inquiry into the varieties of sensation, 1—nature of sensation, *ibid.*—defects in the theories of Drs. Hartley, Reid,

and Darwin, 2—physical changes on the external organs of sensation, 3, 4—and on the internal organs, 5—on the organs of taste and smell, 6, 7—on the sense of touch, 7, 9—the rete mucosum, the seat of sensation, 9-11—proof that the sensation awakened in any organ depends on the peculiarity of the organ, 12-17—the use and end of the different varieties of sensation, 17-22—simple mechanical distension, the cause of the actions of involuntary organs, 22-24.

On the laws of muscular motion, 223—muscular motion defined, 224—theories of Haller, Whytt, and Bichât examined, 225, 226. See *Muscular Motion.*

Parturition facilitated by the use of ergot or spurred rye, 66.

Péron, (M.) historical notice of, 294—his birth and education, *ibid.*—enters the republican army, 295—studies medicine and natural history, *ibid.* 296—engages in an expedition to the South Seas, as a zoologist, 296, 297—account of his researches and discoveries, 298-300—returns to France, 300—result of his labours, 301—general character of the published narrative of his voyage, 302—notice of his unpublished works, 303—his character, 304, 305—anecdotes of his integrity, 306—last illness and death, 307, 308—analysis of the second volume of his Voyage de Decouvertes aux Terres Australes, 382-388.

Pictet, (Professor) on spots in the sun, 420, 421.

Playfair, (Professor) observations of, on some appearances on the sides of mountains in Switzerland, 459, 460.

Platinum, fusion of, with the blow-pipe, 107,

Plutonium, a new metal, notice of, 120.

Polarisation of light, experiments on, 174, 175.

Prevost, (Professor) on the causes of the constant proportion of azote and oxygene in the atmosphere, 421—423.

Proceedings of Societies.—The Royal Society of London, 204-206, 457-459—the Royal Society of Edinburgh, 206-208, 459-461—the Academy of Sciences of the Royal Institute of France, 179-190.

Publications, (foreign) quarterly list of, 219—222.

Pyrenees, botanical researches in, 50, 51.

R.

Raffles, (Hon. T. S.) account of the Sunda islands and Japan, 190-198.

Rain, temperature of, in Paris, 448.

Ramond, (M.) result of his botanical researches in the Pyrenees, 51.

Refraction, effects of mechanical pressure in communicating double refraction to regularly crystallised bodies, 460.

Repulsion and attraction without electricity, phenomena of, 427, 428.

Rete mucosum, the seat of touch, 9-11.

Right hand, why used in preference to the left, 423, 424.
Rivers, observations on the junction of the fresh water of, with the salt waters of the sea, 208.
Ronalds, (Francis, Esq.) account of an atmospheric electrometer, 249-253.
Royal Institute. See Academy of Sciences.
Royal Institution, notice of lectures at, 465-468.
Royal Society of London, proceedings of, 204-207, 457-459—list of the council and officers of, 459.
Royal Society of Edinburgh, proceedings of, 207, 208, 459, 461.
Rye, experiments on the clavus or ergot of, 61—effects of spurred rye on the human system, 62—first used as a medicine in America, 62—notice of cases in which it was exhibited, 63, 64—its efficacy in facilitating parturition, 66—proofs that the clavus or ergot is a species of sclerotium, 273-277—discordant opinions in France on that subject, 321—its physical and chemical properties, 322—experiments of M. Vauquelin on the ergot of rye, 323-326.

S

Salisbury, (R. S.) observations of, on the coniferous plants of Kæmpfer, 309-314.
Salt, notice of a mountain of, in Spain, 153, 154.
Sandwich islands, state of, 72—improvements effected by their sovereign Tamaahmaah, 73—account of his residence and mode of living, 76—state of society in the Sandwich islands, 76, 77—trade of the islanders, 78—their military force, *ibid.*
Schübler, (M.) researches of, on atmospheric electricity, 416-418.
Scientific Journals, (foreign) analytical review of, 151-179, 415-453.
Sclerotium, a genus of fungi, account of, 273, 274—the clavus or ergot of corn, proved to be a species of sclerotium, 275-277.
Scott, (Dr.) on the arts of India, &c. 67—account of the Indian operation for the cataract, 68-72.
Sensation, nature of, 1—defects in the theories of Hartley, Reid, and Darwin, 2—physical changes on the external organs of sensation, 3, 4—and on the internal organs of sensation, 5, 6—and on the organs of taste, smell, and touch, 6-9—the rete mucosum, the seat of sensation, 9-11—proof, that the sensation awakened in any organ, depends on the peculiarity of the organ, 12-17—the use and end of the different varieties of sensation, 17-22—simple mechanical distension, the cause of the actions or involuntary organs, 22-24.
Serpents, account of new species of, discovered in the Antilles, 181, 182.
Shepherds of the Landes, account of, 253, 254.
Ship's way, account of a new machine for measuring, 90, 91.
Silex, fusible by the blow-pipe, 110—experiments and observations on the combinations of silex in cast iron, 285-293.

Smell, organ of, peculiarly adapted for its object, 6.
Soaps, hard, experiments on the manufacture of, 444, 445.
Soemmering, (M.) on a new mode of mellowing wine, 148-150.
Spots in the sun, observations on, 420, 421.
Strontian, fusion of, with the blow-pipe, 109—metal of thus obtained, 121—experiments to determine the quantity of strontian contained in several species of arragonite, 164.
Sugar, producible from fecula, by means of gluten, 167.
Sunda islands, account of, 190—physical constitution and productions of the isle of Banca, 190, 191—process of mining pursued there, 191, 192—notice of Borneo, 192—geological constitution of Java, 193—remains of antiquities discovered there, *ibid.*—language of Java, 194—practices peculiar to the Sunda islanders, 195.

T.

Tadpole, observations on the formation of fat in, 205, 206.
Tamauhmaah, sovereign of the Sandwich islands, improvements effected by, 73—account of his residence and mode of living, 76.
Tarchonanthus camphoratus, observations on, 175.
Tayloria Splachnoides, a new species of moss, account of, 144-147.
Temperature, changes in, caused by local circumstances, 44, 45—of the air, sea, animals, &c. within the tropics, 208-210.
Thenard, (M.) analysis of his *Traité de Chimie*, 255—remarks on his mode of treating chemical affinities, 256, 257—on heat and expansion, 258-260—on cold, 260—defects in his chapter on light, *ibid.* 261—on electricity, 261-263—on chlorine, 264—and combustion, 265—remarks on his classification of metals, 266-267—and on the metallic salts, 269, 270—defects of his chemical physiology, 271—concluding observations, 272.
Thirst, sense of, how produced, 12.
Thomson's, (Dr.) system of chemistry, character of, 253.
Tin mines in the isle of Banca, how wrought, 191, 192.
Tooth-ache, cause of, 17.
Touch, organ of, adapted to its peculiar functions, 6, 7—the *rete mucosum*, the seat of touch, 9-11.
Trees, importance of, in mountainous countries, 57.

V.

Vaccination, discovery of, modestly claimed by the French, 169.
Vaudoncourt, (General,) notice of a map of Turkey, by, 212.
Vauquelin, (M.) experiments of, on the ergot or spur of rye, 320-326.
Vegetable nature, general views of, 35—developement of the laws by which different tribes of vegetables are distributed over the globe, 35, 44—effects of cold, heat, light, and air on vegetation, 46-48—important results produced by vegetation, 58-60.

Vesuvius, mount, appearances of, after the eruption of 1812, 25, 26—singular phenomena preceding the eruption in December 1813, 26, 27—account of the eruption of December 25 and 26th, 28-32—analysis of volcanic products, 33, 34.
Vision restored when injured or destroyed by the cornea assuming a conical form, 403-415.
Vogel, (M.) on the mutual decomposition of acids and sulphuretted hydrogen gas, 152, 153.
Volcanic rocks, on the composition of, 434.

W.

Wahlenberg, (M.) observations made by, in the Carpathian mountains, 441, 442.
Water, extraordinary disappearances of, in the neighbourhood of mount Vesuvius, 27, 28.
Wheat, remarks on the ergot of, 65—this disease proved to be a fungous excrescence, a species of sclerotium, 273-276.
White Mountains of New Hampshire, account of, 392-395—geological appearances of, 396—their vegetation, 397-399.
Whytt, (Dr.) theory of, on muscular motion, examined, 225.
Wine, a new mode of mellowing, described, 148-150.
Wire-gauze safe-lamps, efficacy of, 464.
Wollaston, (Dr.) on the glazier's diamond, 205.

Z.

Zamboni's dry galvanic pile, experiments on, 161.
Zecchinelli, (M.) on the use of the right hand in preference to the left, 423, 424.
Zoological geography, observations on, 386-388.

ERRATA.

Page 347, l. 19, *pro* " orchroleuca" *l.* " chloroleuca."
—— 349, l. 3, à calce, *pro* " effusa" *l.* " suffusa."
—— 360, l. 8, a calce, *pro* " obsoletè" *l.* " rotundatè."
—— 366, l. 15, *pro* " *Bulbispermæ constanter!* " *l.* " *Bulbispermæ Constanter?* "

London: printed by W. Bulmer and Co.
Cleveland-row, St. James's.